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THE INFLUENCE OF DIFFERENT EDUCATIONAL EXPERIENCES ON CLASSIFICATORY AND VERBAL REASONING BEHAVIOUR OF CHILDREN IN GHANA

by

© DOMINIC KWAKU FOBIH

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF DOCTOR OF PHILOSOPHY

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THE UNIVERSITY OF ALBERTA

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled "The Influence of Different Educational Experiences on Classificatory and Verbal Reasoning Behavior of Children in Ghana", submitted by Dominic Kwaku Fobih in partial fulfilment of the requirements for the Degree of Doctor of Philosophy.

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Date May 4, 1979

DEDICATION

To my beloved father

Odikro Kwadwo Fobih

and

beloved mother

Mame Yaa Pomah,

all of blessed memory,

who sent me to school

ABSTRACT

The study examined the relative influence of different educational experiences on rural Ghanaian children's cognitive development as manifested in abstract classificatory and verbalization tasks. Based on the empirical literature reviewed, it was hypothesized that subjects with good schooling (GS) would significantly outperform those with either poor schooling (PS) or the traditional informal education (US), while the latter two groups would show no difference.

Seven rural schools were classified into good schools and poor schools as defined by George (1976) and the Ghana Education Department (1954) guidelines respectively. Two of each school type were then randomly selected and rated for quality verbal experience through an instrument designed by Flanders (1968) with some modification to measure Teaching Behaviour (TB) and Classroom Interaction (CI). Children from both school types and those with informal education as defined by Scribner and Cole (1973), stratified on age (11-12 years, i.e., grades 5 and 6) and sex, forty subjects from low SES and common ethnic background were randomly chosen to form each group (N = 120). Descriptive data about subjects' SES (Ghana 1960 SES scale), Abstract Ability (AA) as measured by the Raven's Progressive Matrices and Demographic data (DD) were also collected and analysed.

Cognitive operational development of children was measured through culture-specific Abstract Classificatory (AC) and Verbal

Classification (VC) tasks designed by Greenfield, Olver and Reich (1966) and the Logical Verbal Reasoning (LVR) problems used by Cole and Scribner (1974).

The findings indicated that good schooled children's abstract classificatory and verbalization skills were at a significantly higher level than either poor schooled or unschooled children. Poor schooled and unschooled subjects did not statistically differ on the three criterion measures used. However, poor schooled and unschooled boys were significantly ($p < .02$) superior to their girls' counterparts on the abstract classificatory tasks while no such differences were detected in either the good school sample or on the verbal problems. The good schools were also significantly ($p < .01$) different from the poor schools with respect to the background factors of Teacher Behaviour (TB) and Classroom Interaction (CI). Differences existed in the use of analytical verbal interaction, teachers supportive rapport with pupils and the use of open-ended and probing questions to develop children's ideas. Thus, good schooling through its quality verbal expositional experiences is thought to have enhanced children's concrete operational development and thereby helped to explain the contradictory findings in cross-cultural research literature about the possible effect of formal schooling on concrete abstraction.

Implications for theory, research and educational practice in Ghana were discussed and recommendations suggested for implementation.

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CHAPTER I

INTRODUCTION

Anthropological descriptions have in the past formed the basis for a description of the intellectual functioning of African children. Lévy-Bruhl (1966), for instance, describes primitive cognitive processes as prelogical and mystical implying that the beliefs and reasoning which evolve from them are synthetic, that contradictions are intolerable and that the only abstraction available to prelogical thought is mystical abstraction. Horton (1966) expanded upon Lévy-Bruhl's position by differentiating between what he called the traditional and scientific thought processes of "closed" and "open" belief systems. The closed system is represented by little awareness of alternatives to the established body of theoretical tenets while in an open scientifically oriented culture such an awareness is highly developed (Horton, 1967). Horton believes Lévy-Bruhl was mainly describing predominantly closed systems thus clouding the issue a bit. However, Horton further suggested that despite the apparent diversity between the closed and the open systems, their underlying logic is similar. Thus, differences exist only in the premises used by the people of the closed system. However, Horton's analysis leads to problems because of the similarity of logic underlying both open and closed systems.

Even though there is confusion about disagreement with, and a lack of general acceptance of these earlier anthropological inferences about cognitive processes in traditional societies (Price-William, 1962; Tulkin & Konner, 1973; Cole & Scribner, 1974; Cole, Gay, Glick & Sharp, 1971; Greenfield, Reich & Olver, 1966; Irwin & McLaughlin, 1970), they formed the groundwork for current cross-cultural psychological studies. The current perspective on cognitive development has grown considerably from its anthropological roots (see Lévi-Strauss, 1966, as a transitional research and Cole et al., 1971, as current researchers). Several reasons account for this change of attitude. One of these reasons is the method employed in those anthropological studies. For example, many of the psychological inferences of cognitive behaviour were drawn from observations based on belief systems, brain size, shapes, fissuration and cortical histology (Carothers, 1953, 1972; Lévy-Bruhl, 1966; Cryns, 1962) which have not been scientifically proven to have any relationship to one's level of intellectual functioning.

The major criticism, however, against the anthropological theorists is their uncritical equating of primitive culture with primitive thought. Culture may exercise profound influence on the kind of strategies a person brings to bear on intellectual activities yet it cannot be the sole determinant of thought itself (Cole & Scribner, 1974; Cole, Gay, Glick & Sharp, 1971; Bruner, 1966). An individual is also endowed with an innate potential for intellectual activity (Boas, 1966). Culture's effect on cognition can thus, only shape the direction of its expression to meet the needs of the particular

environment (Cole et al., 1971; Bruner, 1966). Thus, a person may possess the potential for a certain way of conceptualization, yet it may go unrecognized due to lack of proper assessment.

In addition to the above, other investigators have failed to find evidence supporting Horton (1966), and Lévy-Bruhl (1966). For example, Margaret Mead (1932) reported that while animistic thought was a major aspect of Manus adults' mental life, it was non-existent in the cognitive activities of Manus children. It would make sense to assert that primitive thought is not totally governed by animistic thought. Mystical and animistic reasoning may be a skill acquired through the process of socialization.

As opposed to the contentions of Horton (1966), and Lévy-Bruhl (1966), many writers have posited that a number of cognitive functions may be important factors differentiating the thought processes of primitive and civilized societies (Cole et al., 1971; Tulkin & Konner, 1973; Lévi-Strauss, 1966). Lévi-Strauss (1966) for example, reports that primitive and civilized societies use different cognitive functions for classification. While primitive classificatory systems are, by and large, based on perceptible qualities and on concrete experience within the community, modern scientific thought relies heavily on inferred properties from relations in the structure of stimulus objects. Thus, different cognitive strategies appear to be employed by children in task situations. Additionally, these different cognitive strategies seem to be partially dependent on the exposure of the children to different educational experiences since educational experiences may be informal, as prevails in traditional societies, or

formal since Western societies typically have more formal educational systems. Ausubel (1968) and Bruner (1966) support Lévi-Strauss' position with findings which indicate that a child's formal school experience can affect cognitive development to the degree that it can be equated with changes associated with growth.

The psychological construct of Piaget's cognitive growth also indirectly implies a similar view. The individual's intellectual development is the result of "logico-mathematical" experience (i.e., the person coming to grips with his environment) which together patterns the course of one's learning (Ginsburg & Koslowski, 1976). Thus, while development might usher the individual into the acquisition of a global concept, such as classification, it is the nature of this person's unique learning experience which helps to abstract the concept or refine it in detail (Ginsburg & Koslowski, 1976). Cognitive development then is the joint product of the ontogenetic development of the individual and the unique learning experience of the individual.

An important psychological construct in Piaget's conception of intellectual development is the stage of concrete operations. A central feature of concrete operational thinking is the ability to classify. The significance of classificatory ability in operational thought processes is that the child who can classify can also reason logically about the properties of things by adhering to unambiguous criteria (Inhelder & Piaget, 1964). The attainment of this operational development involves major thought processes. For instance, the child who has attained this level of intellectual functioning shows

characteristics of reversibility in thought, part-whole relationship (i.e., class-inclusion) and "intension" and "extension" of the criterial attribute. This type of cognitive behaviour is qualitatively superior to the type of classification based on perceptual features at the pre-operational level (Inhelder & Piaget, 1964; Wadsworth, 1977). These cognitive characteristics of abstract classification ability are not attained through verbal mediation. Knowledge or concepts transmitted to the child via language alone will not only fail to fit into the child's existing cognitive organization, but will result in the child being less able to remember or apply the concepts (Piaget, 1953).

This Piagetian view is, however, not shared by some linguistic theorists and cognitive psychologists (Whorf, 1940; Carroll, 1963; Bruner, 1966; Ausubel, 1968; Chomsky, 1957). Rather, these theorists postulate that language may have one of three possible relationships with thought. Instead of thought determining language as suggested by Piaget, it is language which can either hinder or facilitate the development of a child's thought processes (Bruner, 1966; Herriot, 1971; Whorf, 1940; Carroll, 1963). Alternatively, the developmental patterns of language and thought may be totally independent of each other (Chomsky, 1957; Furth & Youniss, 1971) yet both may have interactive effects, despite their separate roots (Ausubel, 1968; Vygotsky, 1962). Such propositions about the influence of language on the development of thought would seem to indicate that language, at the very least, may have some effect on a child's cognitive processes. Therefore, it is reasonable to expect that a child's attainment of

abstract classification may be influenced by either the language he uses to conceptualize the world (Chomsky, 1957; Carroll, 1963) or by the verbal exposition of the formal school learning (Ausubel, 1968; Bruner, 1966, 1975; Scribner & Cole, 1973). Hence, language may serve as a useful indicator of a child's cognitive developmental level. Consequently, a number of cross-cultural empirical studies have employed both verbalization and abstract classification abilities as correlates of a child's level of cognitive development (Cole & Scribner, 1974; Cole, Gay, Glick & Sharp, 1971; Evans & Segall, 1969; Greenfield, Reich & Olver, 1966). However, these researchers have only been concerned with formal education experience as a global concept with little regard to the qualitative aspect of the experience. As a result, a considerable number of empirical studies have failed to establish significant differences in the classificatory and verbal behaviour of schooled and unschooled subjects (Goodnow, 1962; Price-William, 1962; Goodnow & Bethon, 1967; Mermelstein & Shulman, 1967; Irwin & McLaughlin, 1970). From these latter studies, one may suggest that the evidence as to the relative importance of the formal school experience in contrast to the informal home educational experience in attaining operational thought is inconclusive.

Since these studies had only used a global concept of formal school experience, an alternative suggestion for the non-significant differences between schooled and unschooled subjects was that the lack of significant results might be related to the quality or richness of the schooling experience. A "good" school might promote significant changes in children's cognitive skills while a "poor"

school might not necessarily achieve a similar objective, at least, within the context of the elementary school grades. For the school experience to be effective, it must undoubtedly fulfil a certain standard of quality. When such a condition has not been fulfilled, the theory of formal schooling as an effective medium for promoting cognitive growth might not hold. Hence, rather than schooling per se, it might be the quality of the school experience which was the important factor in distinguishing schooled from unschooled subjects on their classificatory behaviours.

It was hypothesized that one reason for the lack of result in these studies lay not with the non-existence of school differences, but rather with the type of schools chosen for the studies. Very few of the studies conducted have provided adequate descriptive data about the schools used in the research. Such data could clarify the inconsistent findings by providing information as to the qualitative differences existing among the schools used in the studies. An investigation into the influence of the quality of the formal school's experience was therefore needed. Such an investigation would help to ascertain the nature of conditions under which formal education influences or may not influence children's performance on cognitive tasks.

CHAPTER II

REVIEW OF LITERATURE

Introduction

Language has been proposed by some psychologists (Bruner, 1966; Vygotsky, 1962; Ausubel, 1968) as a correlate of intellectual growth and has been empirically supported by cross-cultural research. These empirical studies have generally demonstrated that in addition to abstract classification, which may distinguish schooled from unschooled subjects, the quality of verbalization on the sorted operations as well as the verbal reasons given on logical reasoning problems show significant differences between the groups. The trend of these differences have shown superior performance of schooled subjects over those without the formal school experience (Cole & Scribner, 1974; Cole, Gay, Glick & Sharp, 1971; Scribner & Cole, 1973; Greenfield, Reich & Olver, 1966; Evans & Segall, 1969). From these findings, it appears that language is not only necessary for thought but it, indeed, exercises considerable influence on a child's development of the logic which are involved in operational classification at the concrete operation stage. Therefore, in this chapter in addition to presenting Piaget's theory of abstract classification at the concrete operation stage, the relationship among language, culture, thought and schooling will be examined. In addition, empirical support relating to the effects of schooling on children's classification, verbalization

and logical verbal reasoning behaviours on cognitive operational tasks will also be provided.

Theories

Piaget

A large body of cross-cultural Piagetian research has concentrated on the changes in children's cognitive structures associated with the transition from the intuitive stage of pre-operational thought through concrete operations stage. One important characteristic of this transition is the attainment of abstract classification. Internalized abstract classification has been defined as "the recognition of class-inclusion (i.e., entire class) which involves the "intension" and "extension" of a concept (Elkind & Flavell, 1969; Inhelder & Piaget, 1964). A central factor in the development of abstract classification is the child's attainment of decentration. This process allows mental flexibility and enables the child to simultaneously consider multifarious classes or dimensions (Sigel & Cocking, 1977).

Operational classification is a significant improvement over the child's earlier stage of intellectual functioning in that it is an internalized cognitive action which liberates the child from the perceptual features of stimulus situations (Flavell, 1964). The logical operations involved in classification become the primary mode for the child to organize schemata (experience) at a more superior level. This superior organizational level allows the child

to solve transformations of the physical world in both reality and in thought.

The development of these superior mental operations which are responsible for abstract classification emerge in a relatively uniform and well ordered manner. During the early stages of development of the classificatory schema, the child centers on only one dimension (usually colour) and lacks the ability to see part-whole relationship. Later, one develops the ability to co-ordinate schemata at the concrete operational level and can then "turn round on schemata" (i.e., re-trace his steps) and thus abstract the criteria of generalization. This element, the ability to retrace one's steps in logical inference, Inhelder and Piaget argue, "is not an innate characteristic of thinking nor is it simply a mode of organization forced on us by the world as experienced" (Inhelder & Piaget, 1964, p. xvi). It is one that we construct by co-ordinating our own actions and abstracting the relations between them (Piaget, 1970). Thus, the direct action by the person is a necessary ingredient for the development of classificatory operations.

The final stage in the development of classification is "intension" (i.e., similarities and differences) and "extension" (i.e., entire class) of class schema. These operations are perfected at the stage of equilibrium reached between nine and eleven years (Inhelder & Piaget, 1964).

These theoretical evolutionary steps underlie the development of concrete operational classification and thus exemplify the type of abstraction concrete operational children exhibit when confronted with classificatory problems.

The specific operations involved in abstract classification involve the ability to reason logically about the properties of things by adhering to unambiguous criteria (Inhelder & Piaget, 1964). This process is less susceptible to external reinforcements and develops when activities are placed into their proper relationships by the child (Wadsworth, 1977).

The operational systems involved in logical abstract classification rest on five main properties which ensure immunity from inconsistency (Berlyne, 1957; Kohnstamm, 1967). These properties are:

1. Composition or closure (i.e., A + A' = B). E.g., all men and all women = all human adults.
2. Reversibility (i.e., B - A' = A). E.g., all human adults except women = all men.
3. Associativity (i.e., [A + A'] + B = A + [A' + B]). All vertebrates and all invertebrates = all human beings and all sub-human animals.
4. Identity or null operation (i.e., A - A = 0). E.g., all men except those who are men = nobody (i.e., reversibility by negation).
5. Tautology (i.e., A or A = A). E.g., all men and all men = all men.

The child's use of these processes presupposes logical reasoning and enable him to handle both class-inclusion and supraordinate problems--i.e., co-ordinate comprehension and extension (Piaget, 1953; Wadsworth, 1977).

Language, Culture and Cognition

Given the above Piagetian developmental sequences, some linguistic theorists (Caroll, 1963; Herriot, 1971; Whorf, 1940) propose that the child's development of these cognitive structures and mental processes is intimately related to the nature of his native language. The reason being that the language the child learns as a child directs the particular way he experiences and conceptualizes the world (e.g., including abstraction, rationalization and categorization; Carroll, 1956, 1963; Herriot, 1971). For example, a child's conception of things depends on categorizations which draw attention to particular aspects of the environment. The ways of categorizing things and people are transmitted through the language he hears. Instructions, directions, and descriptions of things are expressed to the child via the verbal mode. Verbal labels, thus, not only become crucially important in the child's attainment of concepts but also are the chief medium of the child's thinking. The child cannot, therefore, think without making use of the language he speaks (Greene, 1975). This perspective presupposes that the cognitive operations exhibited by different cultural groups reflect the different ways they code and decode reality. Such a linguistic determinist view would, however, tend to reduce the viability of qualitative school differences as an explanation of the inconsistent results found when investigating classificatory behaviour in cross-cultural research. Thus, to determine whether the influence of quality of schooling is a viable explanation of the inconsistent results, the relative influences of language on thought or of thought on language need to be explored.

In addition to the linguistic determinism of thought, are three other positions which generally exist in psychological literature. These positions are:

a. Thought and language are totally independent,

b. Thought and language are basically independent, but interact in specific ways,

c. Thought determines language.

The first of these views, the independent position of the language-thought relationship, indicates that every child is equipped with an innate "Language Acquisition Device" (LAD) linked to his maturational development which enables him to attend to, abstract and process environmental stimuli (Chomsky, 1957). Once the child attains a certain maturational level both his thought and language abilities automatically also attain an equal level of competence. Hence, neither language nor thought by itself alone can affect the developmental patterns of the other. Rather, the important determinant of a child's language or cognitive development is the pace of his maturation (Furth & Youniss, 1971). Consequently, a child's inability to use complex language structures indicates only his poor linguistic performance but may not necessarily affect the child's linguistic competence or the inner thought processes (Turner, 1975).

Although the above position maintains that language and thought have separate roots, both may in part be said to have interactive effects on each other (Clark, 1973; Sinclair-de-Zwart, 1973; Vygotsky, 1962). As Ausubel (1968) has pointed out, language could be a product of a child's cognition, but language in turn, can also pattern and

limit his cognitive development. For example, during the early years of a child's development, his speech is "pre-intellectual" but as soon as he reaches age two onwards, the child employs "pre-linguistic" thought. At this latter stage, the child's thought and speech merge together to initiate a new kind of behaviour which makes the child's thought verbal and his speech more rational than his earlier "pre-intellectual" speech era (Vygotsky, 1962). A strong relationship, therefore, may exist between language and thought. This relationship apparently becomes more important as the child develops, for it appears that language internally monitors and structures internal thought before it is then communicated externally. For instance, in expressing thought, the child may be merely applying spatial and temporal terms. Some of these meaningful notions developed by the child may not, in some cases, be easily expressed linguistically in some languages yet they may exist in the child's cognitive organizational structure (Clark, 1973). Therefore, it is possible for the particular language the child uses to either limit or facilitate the expression of his already acquired cognitive skills (Slobin, 1973).

Some theorists, however, believe that the interactive view provides a weak explanation for the relationship between language and thought (Lenneberg, 1967; Piaget, 1967, 1974; Sinclair, 1970). These authors feel that rather than language interacting with a child's cognitive behaviour, it is the child's cognitive maturational development which helps to transform the structures of the child's language (Sinclair, 1970; Piaget, 1953, 1974). Piaget (1974) further suggests that language is a tool for the child, a tool which can facilitate

cognitive development, but which is insufficient to bring it about. It is therefore impossible for the child to understand and use a verbal expression until he has mastered the underlying concepts. What is required in the developmental process is first for the child to grasp the logical operations involved in abstract classificatory operations. Once the underlying operational structures are established, the language reflective of these structures will develop. This analysis would seem to justify the claim that though language itself may be biologically rooted in the same way the development of a child's cognition is, it is not independent (Chomsky, 1957; Furth & Youniss, 1971) or partially dependent--i.e., interactive (Ausubel, 1968; Vygotsky, 1962) on thought, rather its expression, indeed, greatly rests upon the level of conceptualization a child has acquired as part of his cognitive development (Piaget, 1953, 1967; Sinclair, 1970).

This Piagetian view about the development of language and the development of thought is, however, not totally accepted (Bruner, 1964, 1966). While Bruner basically supports the view that language grows out of thought, this holds only for the enactive and ikonic "stages" of development. Once the child attains the symbolic stage, the language-thought relationship changes to the degree that language now becomes the determiner. Bruner reasons that as the child develops, he changes his mode of representing the world in the enactive and ikonic stages, and language is in part determined by the logic and structures of these "stages" of cognitive development. However, as soon as the child reaches the symbolic stage of development, language becomes the crucial factor in ordering and structuring reality.

Language now acts as a great emancipator of the child's cognitive life by freeing him from the perceptually dominating characteristics of his environment. At this stage, language is not only necessary for thought, but it strongly determines its shape, complexity and breadth. The child ceases to be "stimulus bound" (Bruner, 1964, p. 25). Consequently, the child's language now directly influences his thought processes by acting both as the initiator and as the promoter of cognitive development. If this Brunerian view of the language-thought relationship holds, it integrates the other perspectives into a uniform view and the qualitative effects of schooling hypothesis referred to earlier would seem to be a plausible reason for the different classificatory behaviours exhibited by schooled and unschooled subjects in some cross-cultural empirical studies.

Schooling

This strong prominence given to language by Bruner in the development of thought appears to lend credence to the interactive view of language-cognition relationship (Ausubel, 1968; Vygotsky, 1962). For, implicit in Bruner's perspective of cognitive growth is the belief that language changes its functional role during a child's transition from the enactive to the symbolic stages. Consequently, while during the earlier stage of development logical structures are more important, at the symbolic stage the pace of the child's cognitive development depends entirely upon systematic instruction via verbal mode between a tutor and a child (Bruner, 1966, 1975). Language, as the facilitating factor in this interactional relationship, serves both as the

medium for exchange and as the instrument the child employs to bring order into his environment (Bruner, 1965, 1975).

Luria (1959), has a similar discussion on the role of verbal instruction on cognitive development. Verbal instruction, he points out, "inhibits impulsive responses to immediate impressions and make it possible for generalized behaviour patterns to be formed . . ." (Luria, 1961, p. 13). Vygotsky (1962) further proposes that the verbal exposition of school learning trains children to think in relational terms because they are forced to code and re-code information along increasingly abstract dimensions. This transition from concrete to purely verbal mode of thought "is a leap from the sensory to the rational" (Luria, 1971, p. 262) and allows the child to go beyond the limits of immediately obtained sense data. Such a mental achievement, Bruner (1966, 1975) emphasizes, frees the school child from the immediacy and powerful impact of perceptual attributes, such as in classificatory operations, and enables him to see "beyond the information given."

Consequently, a number of cognitive psychologists (Ausubel, 1968; Bruner, 1966; Cole & Scribner, 1974; Schmidt, 1973) suggest that the systematic exposition of knowledge in the formal school environment bring about changes in equilibration which promote reflectiveness and abstraction in children's operations. These cognitive changes, Schmidt (1973) points out, raise the level of abstraction of unschooled subjects to that of those educated in the Western formal school. Schmidt highlights this by saying:

> It would be a miracle if, without the stimulus of the Western-type school, the Kpelle child, for instance, rose to the levels of abstraction and symbolization characteristic of the person educated in the Western tradition; it would be an even greater miracle if he "spontaneously" adopted the groupings and categorizations characteristic of such a person's thinking. (Schmidt, 1973, p. 146)

This perspective on the importance of schooling to children's cognitive developmental level, leads directly to the expectation that there should be cognitive developmental differences between "formal" schooled and "traditional informal" (unschooled) children since the principal attribute of the formal school experience is that the education occurs "out of context" of immediate referents or relevant action (Scribner & Cole, 1973). Formal schools additionally make limited use of observation and frequently begins teaching with a verbal formulation of a general rule or a generalized verbal description which Bruner (1966), Scribner and Cole (1973) refer to as "deutero-learning."

Conversely, in informal traditional education, the child sees and participates in a number of demonstrations (i.e., deals with concrete experiences) from which he acquires some generalized mode of performing his activity (Ausubel, 1968; Cole & Scribner, 1974; Greenfield et al., 1966; Scribner & Cole, 1973). This activity emphasizes observation and de-emphasizes generalized verbal interaction.

This schooling analysis implies that the specialized training of the formal school acts on children's grouping operations and thus, stimulates thought. Formal school children develop an awareness of

problem situations and learn to invent the rules of solution rather than to think of them as controlled by random forces (Bruner, 1975). It is therefore the educational experience of the formal school which may be the prime characteristic that distinguishes schooled from unschooled subjects in psychological cognitive experiments. Given extensive participation in concept formation on a purely linguistic level, as Schmidt (1973) points out, formal schooled children are able to abstract their classificatory operations and extract the logical rules of their verbal reasoning problems better than their unschooled (informal schooled) counterparts. Cole and Scribner (1974) conclude:

> . . . attendance at school apparently encourages an approach to classification tasks that incorporates a search for a rule--for a principle that can generate the answers. At the same time, schooling seems to promote an awareness of the fact that alternative rules are possible. . . . Schooling (and only schooling) contributes to the way in which people describe and explain their own mental operations. (Cole & Scribner, 1974, p. 122)

This attitude of mind referred to by Cole and Scribner (1974) is, however, not automatically attained under every school setting. For children to attain it, the teacher and the school must desire and encourage it by providing pupils with situations and lessons that demand legitimate problem-solving and abstraction (Bruner, 1975). Hence, though formal exposition through the medium of language is important for facilitating the child's cognitive development, there is more to the facilitation process than just the use of language. The essential factor may be, as Greenfield et al. (1966) suggest, in how language is used and what opportunities are provided for different uses of the language the child speaks" (i.e., the experience).

Empirical Evidence

The assumption that schooling does in fact influence a child's language usage and cognitive level as measured by classification ability (Inhelder & Piaget, 1964) has been supported by a variety of empirical studies (Cole, Gay, Glick & Sharp, 1971; Cole & Scribner, 1974; Greenfield, Reich & Olver, 1966; Luria, 1971). These studies can be grouped into three categories; schooling and abstract classification, schooling and verbal classification and schooling and logical verbal reasoning.

Schooling and Abstract Classification

Following up Bruner's idea on the effects of schooling on cognitive development, a great deal of cross-cultural empirical research studies have demonstrated that schooling exercises significant influence on children's performance in classificatory tasks (Evans & Segall, 1969; Schmidt & Nzimande, 1970). Evans and Segall (1969) who have done extensive studies with Ganda children in Uganda have reported the preference patterns for colour and form among the children. The experimental subjects consisted of nursery, elementary school children (CA, 4-15 years = Grades 1-7, N = 180) and comparable ages of unschooled children (N = 32). Both researchers observed that the unschooled children of all ages as well as the children in the early primary grades overwhelmingly sorted by colour. Functional-association basis for sorting emerged only with increased schooling from grade three onwards. They, therefore, concluded that when considering the

development of conceptual functioning involving less obvious stimulus attributes, "educational experience rather than age is the critical factor" (Evans & Segall, 1969, p. 52). These observations and conclusions are closely related to those found by Schmidt and Nzimande (1970) on the sorting behaviour of Zulu schooled and unschooled children. In this study, schooling acted as a significant ($p < .05$) factor influencing the preference for the less obvious sorting dimensions of form and function. Cole and Scribner (1974) provide an explanation for the colour-form shift differences among schooled and unschooled subjects in psychological experiments. Commenting on the shift from colour to form as a correlate of cognitive growth, Cole and Scribner caution that the lack of shifts to alternative criterial attributes found among unschooled children is not due to arrested development. Rather, it indicates the fundamental difference regarding the type of their educational experiences. Schooled children, by virtue of their school learning, have learned to generalize abstractions of conceptual relations to less concrete or familiar tasks whereas the level of operational functioning of unschooled children is mainly restricted to familiar concrete relations (Cole et al., 1971; Irwin & McLaughlin, 1970; Kellaghan, 1968; Price-William, 1962). Evans and Segall (1969) vividly describe this phenomenon about the classificatory behaviour of unschooled children as follows:

> . . . unless Ss (unschooled) are induced by the E to look for some less obvious characteristic and unless they have some counter tendency established by prior experience of the kind gained in school, they (unschooled) will employ the most obvious one available as the basis of sorting. (Evans & Segall, 1969, p. 51)

In addition to the evidence cited above, research studies by Ciborowski (1977), Cole et al. (1971), Irwin and McLaughlin (1970), Luria (1971), Scribner and Cole (1973) have also demonstrated that schooling, indeed, has significant influence on children's abstract classificatory behaviour. For example, Cole et al. (1971), in a stimulus matching test based on colour and form dimensions only, found that the Kpelle unschooled subjects (CA, 6-8, 10-14 years) showed mainly preference for colour over form, whereas a matched group of age mates attending the local school indicated preference (66%) for form. Similar observations have been reported in Asia by Luria (1971) while working with traditional uncollectivized peasants and collectivized literate farmers. More often, the literate peasant farmers exhibited abstract categorization in their operations but the illiterate farmers' choices merely reflected concrete and practical situations. Schooling may, thus, have a significant association in one's operational classification.

However, despite the many positive findings which significantly support the facilitative role of the formal school experience on concrete abstract classification, a few studies (Goodnow & Shulman, 1966; Price-William, 1962; Goodnow, 1962; Kagan & Klein, 1973; Mermelstein & Shulman, 1967) propose that schooling has no effect on the attainment of abstract operational classification characteristic of Piaget's concrete operational stage. The important factor in the attainment of this operativity, these researchers say, is the child's daily experience in his culture. For instance, Price-William (1962) presented Tiv schooled children (N = 140) from Nigeria with a number of tasks

involving familiar animals and plants classifiable in terms of size, edibility, location or colour. His results indicated no consistent difference in the number of shifts in the classificatory operations between both groups of children using these objects as stimuli. Children at ages eleven and twelve, whether schooled or not, followed the developmental trends attributed to Piaget by Berlyne (1957).

Price-William's (1962) surprising findings have generated reaction from Greenfield et al. (1966) who posited the degree of concreteness of the test items used in the experiment as the crucial factor influencing the results. To test this idea Greenfield et al. (1966) designed a study on equivalence grouping in which three sets of pictures mounted on cards were used as experimental stimuli. Subjects for the study were drawn from three populations of Senegalese Wolof children, traditional children without formal schooling (CA, 6-7, 8-9, 11-13 years and adults, N = 58), school children from the same town (N = 57) and school children from Dakar, the capital city (N = 85) of comparable age groups. The results indicated that the children with schooling, whether from the village or the city significantly moved to form and functional attributes above chance level of frequency. This provides evidence indicating that when stimulus items are removed from their immediate context, the difference between schooled and unschooled subjects may become evident. Irwin and McLaughlin (1970) modified the Greenfield et al. (1966) study to include familiar concrete tasks. When subjects were first tested on a card sorting task similar to Greenfield et al., they found a strong significant ($p < 0.005$) difference in favour of children with formal

schooling experience. However, on a subsequent concrete rice sorting task which all the experimental subjects (N = 65, 80) had equal experience in the Mano culture (Liberia), the difference between the schooled and the unschooled levelled off.

Additional information was also provided by Kellaghan (1968) who presented two groups of Western Nigerian Yoruba children (N = 36, 24, CA, 11 1/2-12 1/2 years) with a variety of familiar and concrete objects. Kellaghan (1968) found that the concreteness of the stimulus objects, more than schooling, was the most significant factor accounting for the observed variance between both groups. These findings indicate that the use of culturally appropriate instruments should be one of choosing tasks related to the particular cultural environment rather than using concrete experimental objects. As Greenfield et al. (1966) point out, when cultural stimulus items are placed in their appropriate context, as in the case employed by Price-William (1962), the ultimate operational classification may involve mere discriminations which demand less transformation of the data. Consequently, rather than children's schooling experiences determining their operational classification on the tasks, it is the practical uses of those items which will determine the responses that they make. This creates a ceiling effect which masks the possible influence of schooling.

Aside from the concreteness of stimulus items which may result in lack of difference between schooled and unschooled children, Serpell (1969) provides other evidence which suggests that the quality of the formal school experience may also count, even when test items are removed from their immediate context. When explaining the factors

which controlled colour-form preference in his investigation, Serpell (1969) states that children attending certain schools showed an increase in preference for form over colour, while those in similar grade levels attending other schools preferred colour to form just like the unschooled subjects in the study. Serpell (1969) further emphasizes that even a very young Zambian child showed a form preference if he attended an elite school but the other young school children did not necessarily show such colour-form shift. There is, therefore, some validity in Cole and Scribner's (1974) assertion that the failure of certain school situations to produce the shift from colour to form preference may be a function of the particular kind of educational experience found in those schools. For example, many schools in Africa are staffed with pupil teachers who have minimal educational backgrounds (i.e., just the basic elementary education) and are untrained. Under such a situation, as Serpell (1969) points out, the schools may not place much emphasis on the kind of learning that may lead to the development of form preference or concrete operational abstraction.

Suchman's (1966) findings with Hausa children attending Koranic school in Nigeria add support to Serpell's conclusion. Suchman (1966) found that the Hausa school which encouraged rote learning or memorization without understanding the information did not promote attendance to form. This school experience therefore, proved to be no better than the traditional informal education experience, at least as far as the children's classificatory performance was concerned.

Schooling and Verbal Classification

Although Bruner's (1964, 1975) views on the function of language in thinking conflict with those of Piaget (1953, 1970, 1974), Piaget does concede that language can crystallize a child's operational schema (Inhelder & Piaget, 1964; Piaget, 1968, 1974) and therefore acts as a mediational process which underlies a child's reasoning (Jensen, 1966; Kendler, 1964; Kagan, 1966). For example, in the course of an individual's cognitive development the structures of the mediational units of language change in their hierarchical organization and these changes affect the quality and flavour of reasoning and problem solving (Kagan, 1966). A view similar to Jensen (1966), Kagan (1966) and Kendler's (1964) has been put forward by Irwin and McLaughlin (1970). After a series of cross-cultural classificatory investigations in Liberia, these psychologists found evidence which indicated that a strong relationship exists between a subject's ability to describe correctly the basis of previously sorted tasks and successful completion of subsequent tasks. Such a finding points to the important role that verbal mediation may play in a child's flexible equivalence grouping.

As further support to Irwin and McLaughlin's (1970) conclusion, Bruner (1966), Cole and Scribner (1974) propose that the main distinguishing variable between schooled and unschooled children's cognitive operations in psychological experiments lies with the type of verbalizations employed by both groups to describe their operational activities. This view has been subjected to a number of empirical studies in Africa (Cole, Gay, Glick & Sharp, 1971; Evans & Segall, 1969;

Greenfield, Reich & Olver, 1966) and the findings generally indicate that verbal mediation acquired through the formal school experience helps a child to transform his activity from a perceptual to an operational base. For instance, in a measure of preference for colour, form and number as indicated by what criteria subject chooses to describe when communicating to the experimenter, Cole et al. (1971) observed that the type of verbal structures school instructed subjects (CA, 12-14 years, grade 4-6) gave on the experimental tasks were far more complex than those given by the two groups of unschooled subjects (CA, 6-8, 12-14 years). Additionally, when the three groups were compared on which of the three dimensions (i.e., colour, form, number) their verbalizations were based, subjects without the formal school experience showed a strong bias for verbal descriptions based on colour as opposed to the school children's descriptions which were related to number and form. Though Cole et al. (1971) findings are quite informative, they do not indicate whether or not the other dimensions (i.e., form, number) which were not verbalized by the unschooled group do not completely feature in the classificatory operations of the unschooled children if they had to sort the tasks themselves.

One study which has thrown light on this aspect of unschooled children's operational behaviour is the one conducted by Cole and Scribner (1974). The study combined the way a child operates with his actual sorting operations with the way he describes them. Their findings suggest that while unschooled and schooled subjects were quite similar in their practical classifying activities, both groups were quite dissimilar in the verbal explanations they gave for their

classified activities. Whether colour, form or function formed the basis of grouping, the school subjects consistently used a categorial label or class name to describe their operations (e.g., These are clothes). In contrast, 70% of the non-literate subjects gave just arbitrary reasons such as "I like them this way" or "My sense told me to do it this way" (Cole & Scribner, 1974, p. 182). Further probing into the covert activities of the subject's mind during operational functioning, however, revealed that while the school group actually reflected on the tasks trying to operationalize and develop a solution rule for them, the unschooled subjects did not. Instead, they resorted to emotional activities such as reliance on God for help and gave reasons such as: "God help me." Such syncretic reasoning by the unschooled children may typify what has been construed in past anthropological writings as "mystical or pre-logical thinking" in which the purporting motive underlying a problem solution is attributed to some external force outside the subject (e.g., Lévy-Bruhl, 1966). However, Cole et al. (1971) think that this operational behaviour of unschooled subjects is due to a deficiency in production structure, the result of which leads to improper storage, organization and retrieval of information. Scribner and Cole (1973), on the other hand, do not share either the explanation given by Lévy-Bruhl (1966) or Cole et al. (1971) to account for the poor ability of unschooled children to verbalize properly their classificatory operations. Rather, they suggest that the linguistic behaviour manifested by non-literates in psychological experiments should be interpreted within a habit-hierarchy framework which recognizes that the responses involved are a part of

every child's generative or production structure. The reason for these differences is that the structure exists at different levels and has different potency in every child depending upon his particular prior experience (e.g., formal versus informal).

Despite the significant results reported in favour of school children's complex and abstract verbalization abilities, Price-William (1962), using concrete objects with Tiv children in Nigeria, suggests that the difference between the schooled and the unschooled in the classificatory reasons they gave was not evident. While both groups justified animal groupings on the basis of colour, size and location at a purely concrete level, Price-William (1962) emphasizes that plant groupings were justified on the abstract features of edibility (i.e., function) by both groups. This finding, however, conflicts with many other studies using similar subject groups (Greenfield et al., 1966; Evans & Segall, 1969). In addition, a possible ceiling effect due to what Price-William (1962) himself referred to as "a small amount of formal abstraction encouraged in the Tiv school child" (Price-William, 1962, pp. 58-59) existed in this study. There were also inherent weaknesses of a procedural nature. For example, subjects were prompted with verbal statements that one of the stimulus objects was different and were then asked to give reasons after a pre-test using identical stimulus items (i.e., leaves). Consequently, the subsequent experimental situation which used plants as stimulus items greatly reduced the amount of abstraction that was required in the tasks. This low level of abstraction demanded by the test items, in addition to the poor school experience of the literate group, may be the underlying

factor which levelled off any possible difference that would be expected between the two experimental groups. An important finding in Price-William's (1962) study with regards to this review is his conclusion that both the schooled and the unschooled groups' responses were eked out by circuitous descriptions instead of using generalized statements. The statements used to describe animals were presented as:

> . . . animals that are found in the compound and which could be left to roam about either on their own, which did not attack one and the like. (Price-William, 1962, p. 59)

Indeed, such statements given by both groups reflect a low level of verbalization generally associated with unschooled subjects in most empirical studies (Cole et al., 1971; Scribner & Cole, 1973). Thus, it seems reasonable to suggest that the school children in the study were functioning at a low level of operativity and were therefore, quite dissimilar to school children used in most other studies (Greenfield et al., 1966; Irwin & McLaughlin, 1970). Schooling does not mean mere attendance at a school, it depends upon the type of experience provided in the setting. Thus, we may assume that the Tiv school experience may have resulted from what Cole and Scribner (1974), Serpell (1969) and Suchman (1966) have described as poor schools in Africa. Such an assumption would be consistent with conclusions drawn from findings of a similar nature in which the reasons for the lack of result were attributed to the quality of the formal school experience (Serpell, 1969; Suchman, 1966).

In addition to the above general studies, Greenfield et al. (1966) presented empirical evidence showing that when less concrete stimulus items are used, if the child's school experience is good, the children verbalize on a level more abstract than the verbalization given by children with only traditional informal education. These researchers further observed that not only did school subjects use categorial terms, but their structural sentences were also far superior to those of the unschooled subjects. The unschooled children primarily expressed the criterial attribute of each object separately. No verbalization linking the various objects together was given. For example, while the children with schooling used general verbalization such as: "They are round," the unschooled children verbalized their operations item by item: "This one is round; this one is round" (Greenfield et al., 1966, pp. 309-310).

In addition to the use of itemized or generalized statements in verbal classification operations, the level of difficulty between schooled and unschooled in the three dimensions of colour, form and function used in conceptual classificatory experiments have been examined by some researchers (Evans & Segall, 1969; Irwin & McLaughlin, 1970). According to Evans and Segall (1969), whereas unschooled children could easily express verbally the reasons for their sorting if they sorted by colour, when they chose an alternative basis for grouping (e.g., form or function), they had great difficulty expressing its rationale. Empirical evidence similar to Evans and Segall's (1969) findings has been presented by Irwin and McLaughlin (1970). On a card sorting test with subjects from the Mano tribe in Liberia

(N = 145), Irwin and McLaughlin (1970) observed that students (N = 65) with increasing education (grades 4-6) were significantly ($p < .01$) better able to describe their sorting operations than unschooled subjects (N = 80). The largest difference in percentage of sorts articulated was, however, found on the form dimension. While the more educated students articulated correctly 88.2% of their sorts based on form, only 50% of the non-literate group were able to do so. These findings offer support for the mediational role of school language instruction experience on children's operational activity. As Bruner (1966) clearly points out, the school child is normally given ways of representing his classificatory operations that conflict with the enactive and the ikonic modes. Consequently, the child has been helped to cognize both physically and verbally instead of his reflecting on perceptual images alone. Language, as verbal mediators, thus provides means for representing the child's experience as well as means for transforming it. It is no wonder, therefore, that most children who through their formal school experience demonstrate an ability to abstract conceptual relations also can provide complex abstract verbalization in most empirical classification studies (Greenfield et al., 1966; Scribner & Cole, 1973).

Schooling and Logical Verbal Reasoning

The evidence of superior performance of school children on verbal classification also suggests these children manifest this superiority in their verbal reasoning behaviour. Though empirical studies dealing with the syllogistic reasoning ability of literate

and illiterate subjects in developing countries are scant, a few studies have been undertaken in Asia and Africa (Cole et al., 1971; Luria, 1971). The earliest study was conducted about thirty years ago by Luria when working with Asian peasants (Luria, 1971). Relevant studies in an African context have only recently been carried out by Cole et al. (1971) and Cole and Scribner (1974) in Liberia. All these studies indicate that the way subjects with traditional informal education respond to simple verbal syllogisms is significantly different from the logical behaviour of schooled subjects.

In support of Cole et al.'s (1971), Cole and Scribner's (1974) findings, Braine (1978), Henle (1962) and Luria (1971) provide a theoretical basis which may account for the formal school's influence in solving logical reasoning operations. Their analysis shows that the presence of a major and minor premise in a syllogistic problem alone is an insufficient condition for a logical feeling of the incompleteness of the judgment that has to be made by the subject in reaching a logical solution. Rather, it is the presence of some special features of cultural life, such as schooling, which promote this logical awareness. Logical processes of thought, Luria (1971) further emphasizes, is influenced to a larger degree by personal practical experience than by the system of logical ties inherent in the problem. For example, in his study of the traditional Asian peasants and collectivized peasants with schooling, Luria posed questions such as:

> In the north where there is snow all year the bears are white. Town x is there in the north. Are the bears white in that town or not? (Luria, 1971, p. 270)

The verbal responses given by those without formal schooling were striking. The illiterate peasants commonly refused to accept the system of logical assumptions inherent in the statements and gave responses that reflected merely experiential context and arbitrariness such as these:

> But I don't know what kind of bears are there. I have not been there and I don't know. Look, why don't you ask old man x, he was there and he knows, he will tell you. [Or] . . . No, I don't know what kind of bears are there. I have not been there and I don't want to lie. (Luria, 1971, p. 271)

According to Luria, these types of responses were generally typical of the non-literate group and were completely independent of the particular content of the problem asked. The responses given by the unschooled subjects also had a strong relationship to the practical experience of the subject. On the contrary, the peasants from the same village with some years of schooling experience recognized the logical rules in the problems and thereby gave appropriate responses.

Cole et al. (1971), however, did not support a schooling effect on logical reasoning when working with Liberian subjects in Africa. In a specially designed study in which unschooled village elders had to judge the conclusions suggested by the experimenter, Cole et al. observed that when using a group discussion approach, the illiterate elders had no difficulty in responding to the oral syllogistic problems. However, when the same subjects were tested individually and had to draw conclusions from the premises themselves their performance was similar to the findings of Luria (1971). The illiterate subjects' responses were inferred from factual basis or conventional

situations (i.e., specific and particular people or situations) and bore no connection with the logical relations contained in the syllogisms asked. These inconsistent findings are not surprising upon a critical examination of the facts. It is common knowledge that group discussion is the traditional method of arbitration in Africa.

Hence, even though the illiterate elders appeared to be showing a process of active reasoning, it was one which emphasized real and experiential evidence and which therefore may not be applicable to problems calling for theoretical evidence. Besides, the type of educational experience the schooled subjects had is not stated. In line with conclusions drawn from other studies in which poor and minimal school experience were given as the explanation for the lack of difference (Serpell, 1969), it may be that both the literate and the illiterate groups were not entirely different in terms of their educational experiences. The type of school experience the literate group received may have been of an inferior type which, in this case, did not facilitate the logic of reasoning verbally beyond the level nurtured by the traditional informal education. Consequently, the difference between both groups could not be significantly demonstrated.

There is considerable empirical evidence confirming the effect of schooling on a child's reasoning processes (Scribner & Cole). In a study adapted to suit the traditional background of subjects, Cole et al. (1971) compared unschooled adults (N = 30) with high school students (N = 30) attending the Lutheran Training Institute and the Zorzor Training Institute in the interior of Liberia. The results indicated that the content of the verbal problems whether in a

traditional story form or a story with concrete examples, did not significantly influence the responses that were made by the experimental groups. The most significant factor associated with difference in the two groups was the educational background of the subjects. The high school students systematically gave correct answers in the overwhelming majority of cases (90%), while the responses of the illiterate adults were incorrect for 65% of the cases. The research also further demonstrated that children, even if they have had a minimum of three years of schooling, could perform reliably better (82%) than the nonliterate group. The reasons for the inability of illiterate subjects to solve logical reasoning problems may be due to their failure to either accept the premises or their refusal to remain within the boundaries set by the problem (Braine, 1978; Cole & Scribner, 1974; Luria, 1971).

From the results of these empirical studies, it would seem that the ability to make logical verbal judgments depends upon the quality of the educational experience the subject has received. For that reason, unschooled subjects are more likely to be deceived by "context effects" (Henle, 1962), while schooled subjects are not primarily affected to the same extent. Consequently, whereas passing mere judgments on inferences reached by someone (e.g., experimenter) presents no great difficulties to the unschooled child, reaching such conclusions by one's self based on premises given by others (e.g., experimenter) leads an unschooled child to focus attention merely on the concrete content of the problem in arriving at the solution. On the contrary, as empirical evidence demonstrates, schooling dramatically

shifts this concrete mode of making inferences to the logical relations contained in the verbal reasoning problems themselves (Cole et al., 1971; Cole & Scribner, 1974; Luria, 1971). It is reasonable therefore, to assume that these differences in the logic of reasoning between schooled and unschooled subjects may be the underlying factors which also reflect in their operational classificatory performances and verbal behaviours.

Summary

In conclusion, the results of the empirical studies reported here suggest that both the concreteness of test items as well as the quality of the formal school experience may account for those studies which have reported lack of significant difference between student subjects and unschooled children. It would appear that the quality levels of schools in Africa characterized by the availability of trained staff, textbooks and school equipment and the type of structure used as premises (Ghana Education Department, 1954; George, 1976) heretofore ignored in cross-cultural research may also exercise differential effects on their children's operational performances as suggested by Cole and Scribner (1974), Serpell (1969) and Suchman (1966).

Statement of the Problem

This study was designed to investigate the issues involved in determining the role of the formal Western-type school experience on

the attainment of abstract classification and logical verbal reasoning at the concrete operation stage. More specifically, the purpose of the study was to determine the effects of three levels of school experience (formal good school [GS], formal poor school [PS], informal traditional school [US]) on a child's:

a. Classification ability,

b. Covert structuring of classificatory tasks as measured by verbal mediation, and

c. Logical reasoning ability as measured by a syllogistic task.

It was predicted that a "good" school (GS) experience would stimulate a superior abstract classification and logical verbal reasoning behaviour and that no significant difference would exist between "poor" school (PS) and unschooled (US) subjects.

The use of cultural classificatory and syllogistic problems have proved to be both valid and reliable measures of abstraction and logical reasoning ability of West African children (Cole et al., 1971; Cole & Scribner, 1974; Scribner & Cole, 1973; Greenfield et al., 1966). The study, additionally, used the standard version of the Raven's Progressive Matrices (RPM), (1938), as a statistical control over the effects of formal educational experiences on children's verbal reasoning.

Definition of Terms

Poor School (PS). According to the Ghana Ministry of Education classification of schools, the term "poor school" is applied to a

school which is "devoid of equipment, has a large untrained staff and is ill-housed in a church building, bamboo sheds or in other temporary forms of construction" (Ghana Education Department, 1954, p. 5). The same connotation was implied in this study and the term referred to a school which showed the following five main characteristics (Appendix XI-XII):

1. Housed in church buildings, bamboo sheds or a temporary structure.
2. Staffed with four or less trained certificate "A" or "B" teachers in the six classes of the primary department with the rest of the classes supplemented by pupil teachers.
3. Has insufficient textbooks in the basic subjects (i.e., English reading, Arithmetic and vernacular reading) for each child in at least classes four to six.
4. Is without a globe and at least two wall maps in the school.
5. Is without sufficient standard school desks for every child in grades 4-6.

Good School (GS). George (1976) defines good schools in Ghana as those housed in permanent buildings, have adequate supply of textbooks and materials, adequate desks for pupils and all classes staffed with trained teachers. The concept "good school" was distinguished from a "poor school" in this study by the following criteria (Appendix XIII-XIV):

1. Housed in permanent block or brick-built buildings.
2. Staffed with trained certificate "A" or "B" teachers in all

the six primary classes (i.e., grades 1-6).

3. Each child in at least grades four to six has one textbook in the basic subjects (i.e., English reading, Arithmetic and vernacular reading).
4. Has a globe and at least two wall maps in the school.
5. Has adequate standard school desks for at least each child in grades 4-6.

Formal Education (FE). The term is synonymous with schooling where verbal exposition is the medium for imparting knowledge to pupils (Ausubel, 1968; Cole & Scribner, 1973; Greenfield et al., 1966). Bruner (1966) refers to it as "context-free learning." Such an education is given in an institutionalized setting, referred to as "school."

Informal Education (IE) referred to the traditional method of training children to cope with their environment through the process of "imitation, observation and participation" (Busia, 1968; Cowan, O'Connel & Scanlon, 1965; Graham, 1971; McWilliam & Kwamena-Po, 1975; Moumouni, 1968). Bruner (1968), Cole and Scribner (1973) refer to this type of education as "context-bound learning."

Rural Town. A town with a population under 5,000 (Ghana Population Census, 1970).

Abstract Classification (AC). An abstract classification referred to a superordinate concept. The two criteria of abstract classification were "intension or comprehension" and "extension" (Inhelder & Piaget, 1964). Comprehension of a concept was indicated by the correct recognition of particular instances of the class. The sum total of all those items which were members of the given class

constituted the abstraction (i.e., extension) of the concept (Greenfield et al., 1966; Kohnstamm, 1967; see Appendix I).

Verbal Classification (VC). The verbal reasons for the constrained grouping tasks which denote intension and extension of the concept used for the operation. Such verbal statements could be general (e.g., They are round) or itemized (e.g., This one is round, this one is round), (Greenfield et al., 1966; see Appendix I).

Logical Verbal Reasoning (LVR) was defined as the ability to accept or hold the premise of a syllogistic propositional statement in working memory and to utilize it to arrive at a logical conclusion (Cole & Scribner, 1974; Cole et al., 1971; Luria, 1971). This ability was measured by children's responses to the verbal reasoning cultural problems (Appendix II), (Cole & Scribner, 1974).

Abstract Ability (AA) referred to the ability to apprehend configuration of meaningless patterns, see the relations between them and to conceive the nature of the figure completing each system of relations presented, as measured by the Raven's Standard Progressive Matrices (1938; see Raven's 1938 Manual).

Research Questions

The study investigated the relative influence of "good" and "poor" school experiences on abstract classification and logical verbal reasoning with particular reference to Piaget's theory of concrete operations and the theory of schooling as an accelerator of children's abstract operational development (Bruner, 1966; Schmidt,

1973; Scribner & Cole, 1973). If exposure to a "good" school experience facilitated children's operational thinking more than that of a "poor" school or an informal education, this was expected to be evidenced in the measures used; the abstract and verbal classifications of the constrained grouping tasks and the verbal reasoning problems.

It was anticipated that the main hypotheses were confirmed if it could be significantly established at an alpha level of 0.05 that a "good" school experience provided superior effects on children's abstraction and logical operations than "poor" and "informal" education and that both the latter (i.e., PS, and US) were not significantly different in their effects on operational functioning.

In this regard, a number of related questions were raised:

1. Would there be any interaction effects between sex of subjects and the three types of educational experiences (GS, PS, US) on the abstract classification and the verbal problems?
2. Would the abstract classificatory operational functioning in Piagetian construct (Inhelder & Piaget, 1964) of "good" school (GS) subjects as defined by George (1976) on constrained cultural grouping tasks (Greenfield et al., 1966) be significantly superior to both "poor" school (PS) subjects as defined by Ghana Education Department (1954) and unschooled (US) subjects (Scribner & Cole, 1973)?
3. Would the abstract classificatory operation of PS subjects (Ghana Education Department, 1954) on constrained cultural classificatory tasks (Greenfield et al., 1966) be the same

as that of US subjects (Scribner & Cole, 1973)?

4. Would the verbal classification as defined by Greenfield et al. (1966) of GS subjects on the classificatory tasks be significantly superior to both the PS and the US subjects?
5. Would the verbal classification (Greenfield et al., 1966) of PS subjects on the classificatory tasks be the same as that of the US subjects?
6. Would the logical reasoning of GS subjects on cultural verbal reasoning problems adapted from Scribner and Cole (1974) be superior to PS and US subjects?
7. Would the logical reasoning of PS subjects on cultural verbal reasoning problems (Luria, 1971; Cole & Scribner, 1974) be the same as US subjects?
8. What was the exact relationship of subjects' verbal reasoning to educational experience, verbal classification and abstract ability as measured by the Raven's Progressive Matrices (RPM)?

Hypotheses

Applying the questions above to each of the three main dependent measures, four null-hypotheses were stated.

Question 1

Hypothesis 1. There would be no interaction between sex and the three groups (GS, PS, US) on the abstract classification scores, the verbal classification scores, or the verbal reasoning scores.

Questions 2 and 3

Hypothesis 2. The final abstract classification mean scores for the three school types (GS, PS, US) would not differ.

Questions 4 and 5

Hypothesis 3. The final verbal classification mean scores for the three school types (GS, PS, US) would not differ.

Questions 6 and 7

Hypothesis 4. The final verbal reasoning mean scores for the three school types (GS, PS, US) would not differ.

Question 8

Hypothesis 5. The percentage of variance on logical verbal reasoning (LVR) accounted for by schooling (Sch), verbal classification (VC) would be greater than the percentage of variance on LVR scores accounted for by subjects' abstract ability (AA).

CHAPTER III

METHOD

Subjects

The area chosen for the study was a rural community (rural population in Ghana is 71.1%, U.N.O., 1974) located in the central region of Ghana and is inhabited by the people known as the "Assins." Their land stretches from the "Fanti" border, about twenty-five miles from the Atlantic coast, to seventy miles inland to join the "Ashantis." The people form part of the "Akan" linguistic group which is the dominant tribe in Ghana. The local dialect is "Assin" and it is comprehensible to all the Akan speakers.

The people in the study area constitute a homogeneous ethnic group with identical cultural practices, a common dialect and close inter-relationships as a result of the proximity of their towns (approximately five miles from each other). They are also linked by a network of intermarriages.

The population of the towns where the samples were drawn was approximately 2,000 (Ghana 1970 Pop. Census). Subsistence farming is the main occupation of the people.

Until recently, the official policy in Ghana was to begin school instruction in English in grade one in most subjects. This policy has been revised and the local dialect (Assin) is the language of instruction in the first three years of the primary (elementary)

school (McWilliam & Kwamena-Po, 1975). English is, however, studied as a subject in the curriculum in grade one and becomes the instructional medium from grade four onwards. All the schooled subjects in this study were, therefore, bilingual and had some grasp of the English language.

Seven rural schools in the Assin district were classified into good schools and poor schools according to the aforementioned criteria (George, 1976; Ghana Education Department, 1954). Two of each school type were then randomly selected and rated for quality verbal experience through a modified version of Flanders' (1968) observational instrument for measuring Teaching Behaviour (TB) and Classroom Interaction (CI), (Appendix X). Children from both school types, stratified on age (11-12 years, i.e., grades 5 and 6) and sex, forty subjects were chosen according to a table of random numbers (Robson, 1975) to form each group (GS, PS).

Due to the difficulty of securing unschooled subjects, the children in this sample were selected from two towns where the experimenter was known to the inhabitants. The eleven and twelve-year-olds of both sexes in the towns were listed. Stratified on sex and age, twenty children were randomly chosen from each of the towns to constitute the unschooled (US) sample.

In all, there were forty subjects ($n = 40$) in each of the three groups (GS, PS, US), ($N = 120$), with both sexes and ages eleven and twelve equally represented. All subjects came from a common ethnic group (Assin), low SES (Ghana 1960 SES scale) and a rural background. The subjects selected had lived in the towns or attended the schools continuously for at least three years.

Additionally, descriptive data was collected about the subjects with respect to the SES background of a few of their parents (n = 25, N = 75) as measured by the Ghana 1960 SES scale (Appendix VIII) and the subjects' Abstract Ability (AA) as measured by the Raven's Progressive Matrices. Each child's demographic data (DD) relating to educational facilities provided for him or her (i.e., books, newspaper, radio, record player, study table, number of educated siblings) was collected through a questionnaire (see Appendix VII).

Design

Two-Way Anova for each dependent variable was used to evaluate hypothesis 1. If no sex effect was found, planned comparisons (Dunn's procedure) were used to compare the school types (GS, PS, US):

GROUP MEANS

a. GS > PS
b. GS > US
c. PS = US

If a sex effect was found, planned comparisons (Dunn's procedure) were used to compare the sexes within school types (GS, PS, US):

SEX MEANS

a. GS_M > GS_F
b. GS_M > PS_F
c. US_M > US_F

Hypothesis 5 was evaluated by Step-wise Multiple Regression analysis of the influence on logical verbal reasoning by educational experience, verbal classification and abstract ability.

In addition to deriving normal descriptive statistics for the three dependent variables, the classification patterns for first choices of abstract classification and verbal classification were noted and subjected to a Chi-square analysis.

Procedure

Instruments

Abstract Classification (AC). The instrument for this study was the one used by Greenfield, Reich and Olver (1966), (Appendix I), because of its degree of abstraction from the concreteness of the stimulus objects and ease of administration. The instrument consisted of sets of three pictures of objects. Each set could be arranged into three subsets of two objects each, subsets being formed on the basis of similarity of color, shape or function of the two subset members (Greenfield et al., 1966).

All object pictures were common to the Ghanaian subjects. The only adaptation made was the substitute of the colour "red" and "black" for orange (set 2) and blue (set 3), (Appendix I) due to lack of proper referents in the "Assin" dialect. A child's idea of a superordinate concept was determined from his or her correct recognition of the particular instances of the criteria and the universe criteria of such instances. Such a recognition implied intension and extension of the concept (Greenfield et al., 1966; Inhelder & Piaget, 1964).

Scoring. Since function is considered a higher level of abstraction because of its representation as an extension of thought, whereas shape is a step away from the most obvious perceptible attribute, colour (Greenfield et al., 1966), the three critical attributes were scored according to their level of abstraction used as the basis of classification: colour 1, shape 2, and function 3 (Price-William, 1962).

To be given credit for classification, the subject had to either classify on colour, shape or function and both items in the set that shared the critical attribute had to be grouped together (e.g., the two "red" pictures). The subject's degree of abstract classification was determined by his or her total score (Greenfield et al., 1966). A maximum total score of 9 represented high abstraction on the classificatory tasks and a minimum total score of 3 a low level of abstraction if function or colour respectively was consistently used as basis of classification (Appendix VI).

Verbal Classification (VC). The protocol for tapping subjects' verbal classification was like the one used by Greenfield et al. (1966). The researchers point out that the type of protocol they used was able to tap subjects' verbalization behaviour on classificatory tasks and to distinguish schooled subjects' use of verbal class-inclusion from unschooled subjects.

Scoring. Subject's verbal classification responses were scored according to the degree of abstraction as defined by the classificatory tasks. Colour was given a raw score of 1, shape a raw score of 2, and function a score 3 when they constituted the verbalization of subject (Appendix VI).

In order to obtain a score for verbal classification, the subject had to explicitly state the attribute common to the two items of the set previously classified. The response could be either general (e.g., they are round) or itemized (e.g., this one is round, this one is round). The fulfilment of this criterion meant that the extension of the shared attribute to the group had been symbolized by verbal means (Greenfield et al., 1966).

Subject's verbal abstract level was indicated by his total score on the three sets of cards. The minimum and the maximum verbalization scores ranged from 3 to 9 for consistent colour or function reason respectively.

Logical Verbal Reasoning (LVR). The logical verbal problems were based on Cole and Scribner's (1974) syllogistic instruments used on Kpelle children in Liberia. Unfamiliar names of places, things and people were substituted with Ghanaian ones (Appendix II).

According to Cole and Scribner (1974), the problems differ from the traditional syllogisms used by Luria (1971) yet they call for various forms of logical inferences. The cultural familiarity of the materials to West African subjects made them most appropriate for use with children of similar background. Moreover, the modified verbal logical problems provided reliable discriminant reasoning behaviour between schooled nad unschooled groups similar to Luria's (1971) findings.

Scoring. Subject's correct response to the verbal reasoning questions were given a raw score of 1 (Appendix VI). A subject's verbal reasoning index was indicated by his score on the logical

verbal problems (Cole & Scribner, 1974). A maximum total raw score of 6 represented a high verbal reasoning level and a minimum total raw score of 1, a low verbal reasoning ability if only one problem was answered correctly.

Abstract Ability (AA). The Raven's Standard Progressive Matrices (1938), (RPM) was designed to test a person's "intellectual capacity whatever his nationality or education" (RPM Manual, 1938, p. 1). The RPM's standardization was based on Colchester children although comparable studies suggest that the test is culturally fair to children and adults of different nationalities and education between the age range of 6 through 65.

The RPM contains five sets of 12 items each. A person's score on the scale is the total number of problems solved correctly when he is allowed sufficient time to work through all the series. This score is checked against the norm for his chronological age-group to determine his percentile point (RPM Manual, table III, individual test). The level of his intellectual capacity for abstraction (i.e., Spearman's "g") as indicated from the percentile rank is then interpreted from one of four grades (i.e., grades I-IV, RPM Manual, p. 9).

The consistency of a child's work could be assessed by subtracting from his score, the expected scores on each set for the total score on the scale as defined by the manual (RPM Manual, table I, individual test).

The RPM's reliability is not always settled (Burke, 1958). According to the author of the test, the re-test reliability varies with age from 0.83 to 0.93. Pertinent reliability in careful studies with children range from 0.71 to 0.86 (Burke, 1958).

Factor analysis has found the test to be an almost pure "g" test with a small loading of some spatial perceptual factor. The latest data for its reliability suggests a correlation of .88. The split-half reliability coefficient is, however, lower, 0.67 (Burke, 1958).

Although the RPM correlates (0.86) with the Terman-Binet test and has been found to have "g" saturation of 0.82, by itself it is not a test of "general intelligence" (RPM Manual, 1938). One reviewer has also suggested that too many poor items and a low general factor between the five sets militate against very high validity despite apparent homogeneity (Westby, 1953).

Demographic Data (DD). The questionnaire consisted of two sections. The first part asked for information specific to the subject, such as the sex, tribe, grade level and age, place of birth, the number of years the subject had lived in the town and the other places the subject had lived before. Part two of the questionnaire dealt with the subject's home facilities for learning. The child's access to study books, a newspaper, a radio, a record player, a study table or a private room at home were the items checked under this section. In addition, the kinds of help the subjects received from the parents and the educational background of the child's siblings were checked (see Appendix VII).

Scoring. The items were scored "yes" or "no." An affirmative response (i.e., yes) was given a score of 1, and a negative response (i.e., no) a zero score. The maximum score that a subject could obtain was 27 and the minimum score was "0" if none of the subject's responses was positively answered.

Parents' SES Data. The SES questionnaire asked for three main facts about the parents (i.e., mother and father) of the subject. This information related to the parents' economic and educational background, their attitude and assistance to the child, and the parents' opinion about the kinds of contribution the school and the town committees were making towards the development of the local school (see Appendix VIII).

Scoring. The economic and educational information supplied by parents were scored on a three point scale as indicated in Appendix IX. The responses relating to parental aspirations for the subject, assistance to the child and the parents' membership to organizations were all scored "yes" or "no." A "yes" response was scored 1, and a "no" response a zero score. The total maximum that could be scored on the questionnaire was 46. The minimum score was "0" if none of the items were applicable to the parents.

School Environment. The instrument used was the kind designed by Flanders (1968) to measure Classroom Interaction (CI) and modified to include Teaching Behaviour (TB), (i.e., teacher's question type, degree of helpfulness and language of teacher; see Appendix X). According to the Classroom Interaction manual (1966), the CI evaluates the influence pattern of the teacher. It is primarily concerned with verbal behaviour in the classroom.

There are ten categories in the system. Seven are assigned to teacher talk and two to student talk. The seven categories assigned to teacher talk are divided into indirect and direct influence. The tenth category classifies pauses, periods of silence and talk that is

confusing or noisy. As stated in the Manual, the use of only two categories to record all kinds of student talk neglects a great deal of information. However, the major purpose of the categories is the analysis of teacher influence.

For two observers the acceptable inter-rater reliability is .85, but for an individual observer the satisfactory level is at "that level which produces errors in observation which are very small compared with the differences among data being compared" (Manual, 1966, p. 19).

Scoring. The number of the category in each variable (TB, CI) exhibited by the teacher at every three-second period was recorded and summed across all items. The total score on each category was then rated on a four point Likert scale. The total sum scored for all the categories on the TB or CI constituted the teacher's final score on the variable. The minimum score on the Teaching Behaviour was 12 and the maximum 48, while the minimum score for the Classroom Interaction was 10 and the maximum 40.

Test Administration

An advanced letter was sent in September 1978 to the District Education Officer in charge of the district schools, with copies to each of the seven participating schools, to obtain permission to use the schools for the research (see Appendix XV). Then the research was carried out between the middle of November and the third week of December 1978. First, the experimenter inventoried the four selected schools (see Appendices XI-XIV) and established rapport with the study

classes (grades 5 and 6). The experimenter watched and interacted with children at work and at play and taught one vernacular lesson in each class prior to the testing date. Through these informal and formal contacts the researcher became acquainted with the subjects.

Half of the unschooled subjects knew the experimenter since he comes from the same town with them and used to spend most of his vacation time there before coming to Canada. Coming from the same town, subjects had also had informal interaction with him in one way or another.

The other unschooled subjects from the neighbouring town were also known to the experimenter. Through games activities and seasonal cultural festivities, there is always frequent movement of people between the two towns. In addition to informal contact, the researcher planned formal interaction with them through individual home visits.

Demographic Data Questionnaire. The researcher visited the schools and the towns prior to the data collection on the school environment and administered the questionnaire individually to each subject either at the schools' offices (i.e., school samples) or in a private room (i.e., unschooled sample). Each subject's responses were recorded on the blank columns provided on the forms and scored later in accordance with the scoring criteria stated.

Parents' SES Questionnaire. Twenty-five children were randomly chosen from each of the samples (GS, PS, US). Both parents of these subjects were interviewed in the evenings at home with a set of questionnaire (see Appendix VIII). The responses given by the parents were recorded on the questionnaire sheets. This was later scored using

the scoring scheme indicated in Appendix IX. The total score for both parents represented the SES score for each subject's parental background score.

School Environment Observation. The experimenter sat in the classroom behind the students in a position to see and hear the teacher. At the end of every three-second period, the category which best represented the communication event was noted. Each teacher was observed in two lessons and the scores averaged for each of the categories. The average scores were then rated on a four-point scale as shown in Appendix X. The total score on the categories for the variable formed the teacher's final score.

Testing Place (AC, VC, LVR). Normally, one of the teachers' rooms would have been used for the experiment. However, to most school children in the area under study, the teacher is considered an authority figure and anything that has close connection with him or her is reminiscent of this authority. This feeling could restrict the children's behaviour. By the same token, taking the unschooled subjects to the school premises was considered unsuitable since the setting would be novel to them. An unschooled child's conception of a school premise is, indeed, different. It symbolizes a disciplined environment which has specialized behavioural expectations and this could affect his or her performance.

After careful consideration, three different places were selected for test administration. The schooled subjects were tested in their schools' offices without the presence of any of their teachers. For the sake of convenience, the unschooled subjects from

the researcher's town were tested in his own room while that of those from the neighbouring town was done in a private room. In all testing situations attempts were made to ensure that the atmosphere was free from possible distractions (e.g., noise, other attention-demanding stimuli).

Test I (Abstract Classification). Subjects were individually tested by the experimenter in two sessions. In each test, the subject was allowed sufficient time until he made a choice (i.e., tests I-IV).

On entering the testing room, subject was offered a chair near a table 2' x 3' where the experimenter was seated. The researcher thereafter greeted the subject and asked for his name. This was reciprocated by the experimenter who then introduced himself to subject. Next, the experimenter explained what the subject was expected to do by giving the following instructions:

> I'm going to show you three sets of pictures of some objects. For every set I display on this table, I want you to show me the different ways they go together in some way. I'll ask you the reasons for your choices later. Tell me when you finish all your selections.*

After this, the researcher displayed the first set of three pictures, as set out in Appendix I, in front of the subject on the table with the following comments again:

> These are the pictures. Show me now the different ways they go together in some way.

Subject's task was to point to the three possible combinations of the pictures in set I that shared a common critical attribute in

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*All instructions were given in the vernacular, Assin. They are reproduced here as direct literal translations.

some way (i.e., yellow, round, and to eat).

When subject indicated that he had exhausted his choices, all set I items were removed from his sight. An interval of two minutes was allowed to elapse after each set during which the experimenter engaged the subject in a friendly conversation. The purpose was to minimize carried-over effects between sets.

After the break, set 2 pictures were placed in front of subject as before. The placement of the cards on the table was systematically alternated so that no one attribute was consistently placed in one position throughout the three trials (see Appendix I). The experimenter then repeated the instruction:

> Here is another set of pictures. Show me those that go together in some way.

When subject finished all his selections for set 2, the same procedure was followed as before during the display of set 3. Subject's correct responses were scored 1, 2 or 3 when colour, shape or function formed the basis of classification (Appendix VI).

Test II (Verbal Classification). At the conclusion of all the abstract classification tasks, experimenter allowed subject three minutes to relax. When the testing resumed, experimenter went back to set I and re-grouped all the subject's classificatory choices made previously one at a time. On each occasion, the experimenter probed the subject's reasons for classification using the following protocol:

> You showed me that these two pictures go together in some way. Why do you think they go together?

The correct verbalization responses for colour, shape and function were scored in the order: 1, 2, and 3 (Appendix VI). The

same process was repeated for sets 2 and 3 of subject's classificatory responses.

When the researcher finished probing all of subject's classified items, the subject was encouraged to search for further strategies to classify those in the set left out unclassified with the question below:

> Can you show me now any other ways the pictures go together in some way?

An interval of three minutes break was given the subject again before the verbal reasoning test commenced.

Test III (Logical Verbal Reasoning). After the short break, the experimenter introduced the syllogistic test with the following instructions to the subject:

> I have six questions which I want to ask you. Think, and tell me your mind about them.

The experimenter then asked subject the verbal reasoning problems (Appendix II) one after the other and scored his accurate responses with 1 mark each (Appendix VI).

Test IV (Abstract Ability). Before opening the RPM booklet (1938) for the individual testing during the second testing session, experimenter said to subject:

> I'm going to show you 60 different drawings. Each has a part taken out. For each drawing, I want you to show me the right part which fits in to complete it.

Experimenter then opened the booklet at the first illustration, A.I., and gave the following directions:

> Look at this (pointing to the upper figure). It's a drawing with a part taken out. Each of these below

> (pointing to each in turn) is the right part that fits into the drawing. They do not all complete it. For instance, number 1, 2 and 3 are wrong because each does not agree with the drawing but number 6 is nearly right. Which is the right one then?

When subject finished A.1., experimenter turned to illustration A.2., and repeated:

> They are simple at the beginning and get harder as you go on. If you pay attention to the way you found the easy ones, the latter ones will be less difficult for you. Just point to the piece which completes the drawing. Now carry on at your own pace. You can have as much time as you like. There is no need to hurry. Remember each time only one is quite right.

As subject worked through the booklet all by himself, experimenter recorded the number of the piece pointed to in each test on the appropriate scoring sheet (Appendix XVI). He also ensured that the pages were turned over one at a time.

CHAPTER IV

RESULTS OF THE STUDY

The results will be discussed in the following order:

(I) Background factors,

(II) Main dependent variables,

(III) Pattern of first choices on abstract classification and verbal classification, and

(IV) Effects of abstract ability, verbal classification and schooling on logical verbal reasoning.

(I) Background Factors

The Demographic Data (DD), the Abstract Ability (AA) and the parents' SES were subjected to One-Way Anovas to test the hypothesis of equality among the groups. The three samples were not significantly different in terms of the Abstract Ability or the parents' SES background. They were, however, significantly different with respect to the students' demographic background (see Table I). Specifically, the poor school and the unschooled samples were similar, and were both significantly different from the good school sample. The results indicate that the good school subjects had a greater number of learning facilities (e.g., books, and study tables) provided for them (see Table II).

TABLE I

SAMPLE DISTRIBUTION BY SEX AND DESCRIPTIVE STATISTICS ON SUBJECTS' DEMO DATA (DD), ABSTRACT ABILITY (AA) AND PARENTS' BACKGROUND (SES)

VARIABLE		US	PS	GS
SEX	M	20	20	20
	F	20	20	20
DEMO DATA[a] (DD)	$\bar{X}$[c]	4.00	4.58	5.78
	Sd	1.28	1.65	1.73
ABSTRACT ABILITY[a] (AA)	$\bar{X}$[d]	13.10	12.70	13.60
	Sd	2.42	2.89	3.35
PARENTS' SES[b]	$\bar{X}$[e]	22.12	21.76	21.60
	Sd	2.09	2.64	2.63

a. n = 40 for each group
b. n = 25 for each group
c. F = 13.39, p < .000
d. F = .96, p < .386
e. F = .29, p < .748

TABLE II

SCHEFFE MULTIPLE COMPARISON OF DEMOGRAPHIC DATA (DD) MEANS

GROUPS		US	PS	GS
	MEANS	4.00	4.58	5.78
US	4.00			**
PS	4.58			*
GS	5.78			

*p < .004 **p < .000

The results of investigation of the "quality" of the school environment are presented in Table III. The poor schools (PS) and the good schools (GS) were compared on two variables: Teaching Behaviour (TB), and Classroom Interaction (CI). For both variables, the good schools exhibited significantly greater amounts of the characteristic under investigation, therefore, rejecting the hypothesis that the two types of schools would have similar school environments. These results indicate that the teachers in the good schools used greater amounts of verbal interaction and teaching behaviour which provided opportunities for children to generalize, analyse, synthesize and search for contrasts in their school learning experiences.

TABLE III

T-TESTS ON POOR SCHOOL (PS) AND GOOD SCHOOL (GS)

SAMPLES' SCHOOL ENVIRONMENT

VARIABLE		PS	GS
TEACHING BEHAVIOUR (TB)	$\bar{X}^a$ Sd	24.25 8.02	34.42 7.38
CLASSROOM INTERACTION (CI)	$\bar{X}^b$ Sd	19.42 7.93	31.25 5.53

a. t, (df, 22) = 3.232 $p < .01$
b. t, (df, 22) = 4.241 $p < .001$

(II) Main Dependent Variables

The major questions posited at the beginning of this study were: would there be any interaction effects between sex of subjects and the three types of educational experience (GS, PS, US) on the abstract classification and the verbal problems? Would GS subjects' abstract classification, verbal classification and logical verbal reasoning scores be significantly superior to either PS or US samples AC, VC and LVR scores? Would PS and US samples' mean scores on the three criterion variables be the same? These questions were put forth in hypotheses 1-4 in Chapter II.

The means and standard deviations for each of the dependent variables: Abstract Classification (AC), Verbal Classification (VC) and Logical Verbal Reasoning (LVR) are presented in Table IV. Table V presents a test of additivity to assess the interaction hypothesis.

TABLE IV

DEPENDENT VARIABLE MEANS AND

STANDARD DEVIATIONS BY SCHOOL TYPE

VARIABLE		US	PS	GS
ABSTRACT CLASSIFICATION (AC)	$\bar{X}$ Sd	8.63 4.18	8.30 3.65	16.63 1.93
VERBAL CLASSIFICATION (VC)	$\bar{X}$ Sd	2.93 2.54	4.30 2.37	11.00 3.08
LOGICAL VERBAL REASONING (LVR)	$\bar{X}$ Sd	2.78 1.13	3.28 1.34	4.08 0.76

Table VI also shows the results of Two-Way Anova (ANOVA) carried out for each dependent variable using sex (male, female) and type of school (Good School [GS], Poor School [PS], Unschooled [US]) as the independent variables.

According to Table V, hypothesis 1 can be rejected since there was no interaction between sex and school. Table VI shows that hypotheses 2, 3 and 4 can be rejected at the 0.000 level. In addition to a general analysis of hypotheses 2-4, specific comparisons were planned to investigate the differences among the three types of schools on each of the dependent variables. These planned comparisons (Dunn's procedure) were to be carried out (a) between school types if no main effect for sex existed, or (b) between sexes within school type if a

TABLE V

TEST FOR ADDITIVITY (SEX BY SCHOOL TYPE) FOR

THE THREE DEPENDENT VARIABLES

VARIABLE	SOURCE	DF	MS	F	P
ABSTRACT CLASSIFICATION (AC)	Sex by School Type	2	8.953	.785	.458
	Error	114	11.400		
VERBAL CLASSIFICATION (VC)	Sex by School Type	2	3.672	.494	.611
	Error	114	7.428		
LOGICAL VERBAL REASONING (LVR)	Sex by School Type	2	2.100	1.737	.181
	Error	114	1.209		

main effect for sex was found. As indicated in Table VI, no main effect for sex was found for verbal classification and logical verbal reasoning. Therefore, comparisons between schools were carried out. However, there was a main effect for abstract classification, therefore, comparisons between the sexes within school type were carried out.

TABLE VI

TWO-WAY ANOVAS FOR THE THREE DEPENDENT VARIABLES

VARIABLE		DF	MS	F	P
ABSTRACT CLASSIFICATION (AC)	Sex	1	61.634	5.427	.022*
	School Type	2	889.407	78.307	.000**
	Error	116	11.358		
VERBAL CLASSIFICATION (VC)	Sex	1	9.075	1.233	.269
	School Type	2	746.575	101.397	.000**
	Error	116	7.363		
LOGICAL VERBAL REASONING (LVR)	Sex	1	3.675	3.001	.086
	School Type	2	17.200	14.046	.000**
	Error	116	1.225		

*$p < .02$ **$p < .000$

The results of the AC sex difference analysis indicated that the males and females were not different within the good school group while they were different within both the poor schooled and unschooled groups (see Table VII and Figure 1). Boys performed at a significantly higher level than girls on the abstract classification variable in both the unschooled and poor schooled groups. This trend did not hold if both sexes received a good schooling experience. Thus, it appears

that the traditional sex-role socialization which presumably accounts for the poor schooled or unschooled sex difference (Kiminyo, 1973; Nwigwe, 1978) can be counteracted by a good school programme which enables girls to perform as well as boys on the abstract classification.

TABLE VII

DUNN'S[a] COMPARISON OF SEX MEANS WITHIN GROUPS FOR ABSTRACT CLASSIFICATION (AC), ($\hat{\psi}_1$, $\hat{\psi}_2$ & $\hat{\psi}_3$)

$\hat{\psi}_1$	=	$\bar{X}_{GS:M}$	--	$\bar{X}_{GS:F}$	=	16.80	-- 16.45
$\hat{\psi}_2$	=	$\bar{X}_{PS:M}$	--	$\bar{X}_{PS:F}$	=	9.35	-- 7.25*
$\hat{\psi}_3$	=	$\bar{X}_{US:M}$	--	$\bar{X}_{US:F}$	=	9.55	-- 7.70*

a. Dunn's critical value = 1.83 *$p < .05$

Since no sex main effects were found for verbal classification and logical verbal reasoning (see Table VI), planned comparisons (Dunn's procedure) were carried out on the means for the three school types. As can be seen on Tables VIII and IX for both verbal classification and logical verbal reasoning, the good school sample scored significantly higher than either the poor schooled or unschooled children while the latter groups did not differ. These results reconfirm the rejection of hypotheses 2, 3, and 4 and provide specific evidence as to how the school types are different with respect to three measures of cognitive functioning.

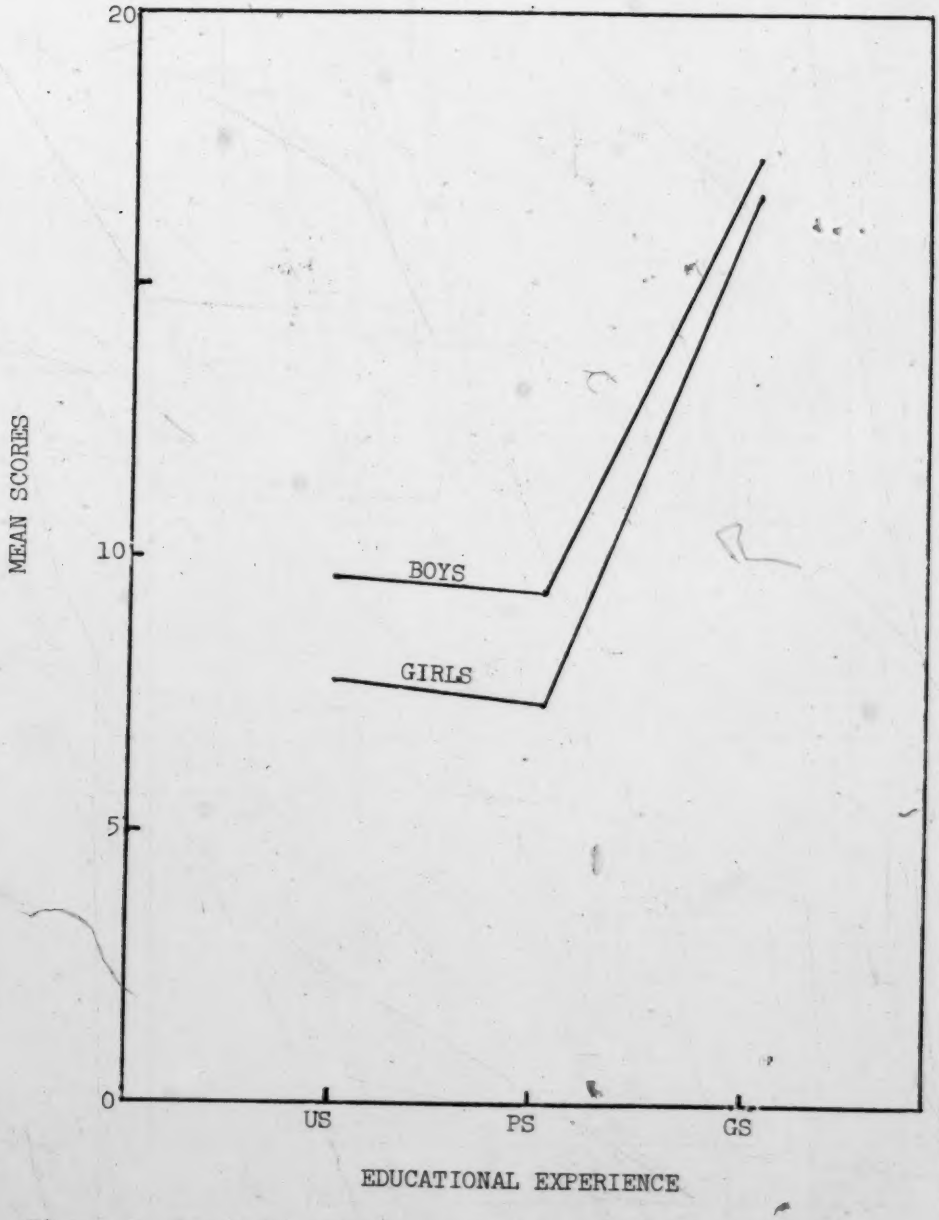

Figure 1. Sex Main Effects on Abstract Classification (AC)

TABLE VIII

DUNN'S COMPARISON OF SCHOOL TYPE MEANS

FOR VERBAL CLASSIFICATION (VC)

GROUPS								
$\uparrow_4$	=	$\bar{X}_{GS}$	--	$\bar{X}_{US}$	=	11.00	--	2.93*
$\uparrow_5$	=	$\bar{X}_{GS}$	--	$\bar{X}_{PS}$	=	11.00	--	4.30*
$\uparrow_6$	=	$\bar{X}_{PS}$	--	$\bar{X}_{US}$	=	4.30	--	2.93

a. Dunn's critical value = 1.48 *p < .05

TABLE IX

DUNN'S[a] COMPARISON OF SCHOOL TYPE MEANS

FOR LOGICAL VERBAL REASONING (LVR)

GROUPS								
$\uparrow_7$	=	$\bar{X}_{GS}$	--	$\bar{X}_{US}$	=	4.08	--	2.78*
$\uparrow_8$	=	$\bar{X}_{GS}$	--	$\bar{X}_{PS}$	=	4.08	--	3.28*
$\uparrow_9$	=	$\bar{X}_{PS}$	--	$\bar{X}_{US}$	=	3.28	--	2.78

a. Dunn's critical value = .6 *p < .05

(III) Pattern of First Choices on AC, VC and Errors

In addition to the above analyses of differences between the three types of schooling experiences, an analysis was carried out to determine if the subjects in the different schooling situations

exhibited a different pattern of first choices (colour, shape, function) for the type of classification used during the classification task. Table X presents the results of a Chi-square analysis of those first choice patterns based on the choices of colour, shape or function as the primary classification scheme. Table X also presents the results of types of verbal justification for these abstract classification and for the errors committed by the children when they gave an incorrect verbalization of a particular type of classification performed. The children's inability to adequately verbalize a classification was considered to be indicative of lower levels of cognitive functioning (Ginsburg & Opper, 1978; Piaget, 1974; Jensen, 1966).

Table X indicates that a significant difference existed among the samples' first choice patterns on the abstract classification (AC), with the poor school and the good school samples selecting colour and function while the unschooled sample selected mainly shape. The Chi-square result of the choice patterns on the VC based on the three criterial attributes (i.e., colour, shape, function) showed no difference. However, when the error responses on the verbal classification (VC) first choices were analysed, there were significant differences between the school types on the VC first choice errors. The results identify the good school sample as being the most accurate on their verbalization of the AC first choices, with the poor school less accurate and the unschooled the least accurate.

TABLE X

CHI-SQUARE TESTS FOR DIFFERENT PATTERNS OF FIRST CHOICES FOR THREE SCHOOL TYPES ON ABSTRACT CLASSIFICATION (AC), VERBAL CLASSIFICATION (VC) AND FOR ERRORS ON VC

TYPE OF INSTRUMENT	df	X^2
First choices on AC	4	17.47*
First choices on VC	4	4.79
Errors on VC	2	10.47**

*$p < .001$ **$p < .01$

Summary

The evidence suggests that the type of schooling definitely influences a child's cognitive functioning. Good schooling provides a facilitative effect on children's operational classification and verbalization. A possible reason for the good schooled children's improved performance is that the good schools provide greater amounts of verbal interaction and analytical experiences. On the contrary, a poor school expositional experience and the traditional socialization concrete experience (Bruner, 1966; Cole & Scribner, 1974) are not different in their effects on Abstract Classification (AC) or Verbalization ability. While it appears that these latter two experiences (PS, US) influence the abstract classificatory behaviour of boys more than girls, neither affect children's functioning to the same extent as good schooling. It would, therefore, seem that a certain quality of verbal interaction is necessary to facilitate the growth of the logic which underlies the abstract classificatory skills of Piaget's concrete

operational stage of intellectual development (Bruner, 1975; Ausubel, 1968; Schmidt, 1973).

(IV) Effects of Abstract Ability, VC and Schooling on LVR

One final hypothesis remains to be reported.

Hypothesis 5. The percentage of variance on logical verbal reasoning (LVR) accounted for by schooling (Sch) would be greater than the percentage of variance on LVR scores accounted for by subjects' abstract ability (AA).

Results. A Step-wise Multiple Regression analysis was used to test this hypothesis. The results are presented in Tables XI and XII.

The hypothesis can be rejected since the percentage of variance in logical verbal reasoning accounted for by school type is 18.70%, while the percentage of variance accounted for by abstract ability alone is only 0.08%. It is interesting to note that verbal classification (VC) alone also accounts for 20.04% of the variance in logical verbal reasoning. This was not unexpected because schooling and verbal classification are strongly correlated ($r = 0.74$, Table XI). Therefore, it would seem reasonable to suspect that when verbal classification is paired with schooling, an experience which is verbal in nature, the variance accounted for by schooling is masked by verbal classification because of the overlap between the variables. Percentages of variance increased only to 22.28% as compared to 18.70% and 20.04% when variables are considered separately (see Table XII).

TABLE XI

CORRELATION BETWEEN THE DIFFERENT VARIABLES OF TYPE OF SCHOOLING (SCH), VERBAL CLASSIFICATION (VC), ABSTRACT ABILITY (AA) AND LOGICAL VERBAL REASONING (LVR)

VARIABLES	SCH	VC	AA	LVR
SCH	1.00	.74	.07	.43
VC		1.00	.17	.45
AA			1.00	-.03
LVR				1.00

TABLE XII

STEP-WISE MULTIPLE REGRESSION: LOGICAL VERBAL REASONING (LVR) BY ABSTRACT ABILITY (AA), VERBAL CLASSIFICATION (VC) AND SCHOOLING (SCH)

VARIABLES	PERCENTAGE OF VARIANCE
AA alone	.08
VC alone	20.04*
SCH alone	18.70*
AA plus VC	21.16*
AA plus SCH	19.11*
VC plus SCH	22.28*
AA plus VC plus SCH	23.16*

*$B \neq 0$, $p < .000$

Post hoc analyses were carried out using subjects' background data (Sch, DD and parents' SES) to predict the dependent variables

(AC, VC, LVR) to make sure that the significant DD finding was not the cause of the differences in the dependent variable results, but rather was the result of the school differences influencing both the students' home learning environment and their operational performance on the criterion variables. The results of the correlations and the step-wise multiple regression analyses are presented in Tables XIII-XVI.

As can be seen from Tables XIV-XVI, whereas schooling predicts 42.42% of the variance on AC, 46.27% of the variance on VC and 22.99% of the variance on LVR, DD and the parents' SES account for just 6.06% of the variance on AC, 3.09% on VC and 4.69% on LVR. Schooling, thus, acts as the largest single predictor, contributing the greatest proportion of the variances accounted for on the dependent variables (AC, VC, LVR).

TABLE XIII

CORRELATIONS BETWEEN THE VARIABLES: SCHOOLING (SCH), ABSTRACT CLASSIFICATION (AC), VERBAL CLASSIFICATION (VC), LOGICAL VERBAL REASONING (LVR), STUDENTS' DEMOGRAPHIC DATA (DD) AND PARENTS' SES (SES)

VARIABLES	SCH	AC	VC	LVR	DD	SES
SCH	1.00	.65	.68	.48	.31	-.09
AC		1.00	.66	.40	.23	-.10
VC			1.00	.45	.16	.06
LVR				1.00	.04	-.21
DD					1.00	-.02
SES						1.00

TABLE XIV

STEP-WISE MULTIPLE REGRESSION: ABSTRACT CLASSIFICATION (AC) BY SCHOOLING (SCH), DEMOGRAPHIC DATA (DD) AND SES

VARIABLES	PERCENTAGE OF VARIANCE
SCH alone	42.42%*
SES alone	0.91%
DD alone	5.23%**
SCH plus SES	42.57%*
SCH plus DD	42.49%*
SES plus DD	6.06%
SCH plus SES plus DD	42.64%*

**p < .05

*p < .000

TABLE XV

STEP-WISE MULTIPLE REGRESSION: VERBAL CLASSIFICATION (VC) BY SCHOOLING (SCH), DEMOGRAPHIC DATA (DD) AND SES

VARIABLES	PERCENTAGE OF VARIANCE
SCH alone	46.27%*
DD alone	2.68%
SES alone	0.37%
SCH plus SES	47.73%*
SCH plus DD	46.53%*
SES plus DD	3.09%
SCH plus SES plus DD	48.01%*

*p < .000

TABLE XVI

STEP-WISE MULTIPLE REGRESSION: LOGICAL VERBAL REASONING (LVR) BY SCHOOLING (SCH), DEMOGRAPHIC DATA (DD) AND SES

VARIABLES	PERCENTAGE OF VARIANCE
SCH alone	22.99%*
SES alone	4.59%
DD alone	0.12%
SCH plus SES	25.98%*
SCH plus DD	24.45%*
SES plus DD	4.69%
SCH plus SES plus DD	27.40%*

*$p < .000$

In summary, the data obtained indicate that the differences in scores on the criterion variables (AC, VC, LVR) could be accounted for by schooling experiences. The abstract ability (AA), demographic data (DD) and SES of subjects appear to have had a negligible effect with respect to either the operational performance or the verbalization behaviour of the subjects in this study.

CHAPTER V

DISCUSSION AND IMPLICATIONS

Background Data

The educational background of the samples provides the most interesting piece of information. Observational data (see Appendix X) about the two school types were collected and rated for quality school environment with respect to the teachers' Teaching Behaviour (TB) and Classroom Interaction (CI). Characteristics observed under TB included the teachers' question patterns, the degree of their helpfulness in class (i.e., use of demonstrations, practical materials) and the centre of the teaching focus (i.e., child-centred or teacher-centred). In addition, the response-initiation pattern of the teachers' verbal interaction with pupils regarding the use of praise, encouragement, acceptance of students' feelings and the development of pupils' ideas were examined. The Classroom Interaction investigated the teachers' initiated interaction patterns (i.e., lecturing, giving directions, criticising, students' teacher-stimulated verbal response and self-initiated talk by students). On both variables (TB, CI), the results showed the good schools to be significantly ($p < .01$) different from the poor schools. The poor schools made frequent use of elliptical questions of the "yes" and "no" type or those which demanded simple affirmation such as "yes sir." Considering the professional

background of teachers (75% untrained) in this type of schools (appendices XI and XII) it may be that they were more comfortable in the use of low level patterns than those which demanded the use of higher level cognitive processes. The child's role in the learning process was one of passivity and unquestionable acceptance of the teacher's ideas with little room for the transformation of the facts being taught. On the other hand, good school teachers rarely resorted to the use of lower order question patterns. Questions addressed to the class generally took the form of: "How would you do so and so if you were in that situation." Or, "What differences do you think exist between this and that?" These patterns required inferences and evaluation of facts by children and frequently resulted in the active verbal involvement in class lessons.

The effective use of such question patterns by the trained staff of the good schools (92%) was no surprise. From student-teachers' practical teaching, Ghanaian Teachers' Training Colleges make deliberate attempts to discourage the habit of asking elliptical or lower forms of questions in class. Thus, having received some training in effective use of higher question patterns, the trained teachers in the good schools had some model to apply which the poor schools' pupil teachers did not have. The poor school teachers, however, seemed to rely primarily on their common sense, and cultural background when asking questions. This cultural experience usually did not seem to demand higher level verbal interactions between unschooled children and adults. For example, unobtrusive informal observations indicated that the types of common verbal communication between adults and

children deal with mainly concrete and practical life situations such as sending children on errands to make purchases, asking the child to perform some duties or the child asking for something from the adult (Bruner, 1965; Greenfield, Reich & Olver, 1966; Scribner & Cole, 1973). In all other interactions, the child's duty was simply to obey and to affirm what he or she was being told by the adult with as little interruption and questioning as possible. Children's involvement in adult conversations, therefore, were quite uncommon and a child who frequently participated in adult conversations or questioned an adult's statement was branded as being disrespectful regardless of the rationale in the child's expressed thought.

This kind of adult-child verbal interaction in the Akan culture gives real meaning to the expression: "Children are seen but not heard," and restricts a great deal of verbal expression and abstraction in the child. Consequently, teachers in the lower grades, who attempted to encourage the child's free verbal expression, found it difficult to overcome the traditional restricted child-language behaviour as exemplified by the following remarks:

> If you ask them [children] anything they don't respond, they only look at your face.

The important thing about this low status accorded to adult-child verbal behaviour in the culture was the poor school teachers' use of similar verbal interactions with their pupils. Consequently, this may be the reason why the verbal learning modes of poor schooled and unschooled subjects were identical and produced the same level of verbal responses from the students on the cognitive tasks.

Two more distinguishing features between the poor schools and the good schools which became apparent in the study were the manner in which teaching directions were given to class and the teachers' rapport with the pupils. Directions given to the children in the poor schools generally were imprecise and often resulted in class confusion. On the contrary, teaching directions in the good schools seemed thorough and fewer disciplinary problems were encountered as a result. Additionally, the teachers in the good schools provided supportive interaction to their students by means such as praising effort or encouraging pupils to "talk their ideas out." This latter method of encouraging children to "talk out their ideas" appeared particularly facilitative in counteracting the traditional adult-child verbal interactive behaviour. Consequently, children in good schools were more verbally involved in class lessons than those in the poor schools.

Perhaps a major reason for the different quality levels of Classroom Interaction and Teaching Behaviour in the two school types (PS, GS) can be attributed to the quality of staffing in the schools (see Appendices XI-XIV). Not only were the good schools better equipped with textbooks and materials but were also well staffed with trained teachers (92%) many of whom had obtained passes in the General Certificate of Education (27%), (G.C.E.--a university entry qualification) at either the Ordinary level or the Advanced level beyond the teachers' "A" certificate level (Appendices XIII and XIV). In contrast, only 25% of the poor school teachers were trained. The bulk of the staff, 75%, were untrained and had only the Middle School Leaving Certificate (M.S.L.C.), (Appendices XI and XII).

The demographic data obtained on the parents and the students provide some interesting insights into the schooling results obtained. The parents were mostly subsistence farmers or petty traders in the low income category (i.e., below ¢2,500 = $1,600), (see Appendix VI) with virtually no formal education. The few who had received some formal education, had not completed the Middle School level. The assistance these parents provided their children was indirectly related to their education and consisted of such things as clothing and food which are the natural responsibilities of a parent. Nevertheless, most parents expressed the desire to assist their children to a greater extent whenever they could do so.

An interesting aspect of the parents' data was the different aspirations they held for their male and female children. Whereas boys were expected to become fitting mechanics, drivers, tailors and, in a few cases, continue their education beyond the Middle School level, girls were never encouraged in this direction. The common expectation held for daughters was for them to become petty traders (i.e., open-market trading) or seamstresses, even if they achieved high grades at school. One reason for this different expectation for girls is that traditionally, female education is looked upon with some suspicion. It is regarded as an unsafe and unprofitable investment. Additionally, the higher the level of a girl's education the more difficult it becomes for her to get married. Therefore, parents are usually not prepared to spend their limited resources on the education of daughters who, after all, might find it difficult to fulfil their traditional sex roles in society. These factors could explain the AC sex effect reported in Tables VI and VII.

An intriguing finding with regard to the descriptive data about subjects was that the good school and the poor school children's demographic data (DD) were significantly different ($F = 13.39$, $p < .000$, Table I) despite the similarity of their parental background. The DD items looked at factors such as the number of books, whether the family had a radio, newspaper, record player or if a study table was made available to the children and the number of educated siblings in the family. On all these items, the poor school and the unschooled samples did not differ. However, the good school sample proved to be the privileged group with respect to the availability of most of the items. One reason for this was that although the government's freely supplied textbooks were restricted to school use only the good school teachers, using their initiative, loaned some of their school textbooks to their students to take home. An idea which the poor school teachers had never contemplated, despite the lack of books in the children's homes. Furthermore, most of the good school children had improvised their parents' dinner table as study tables. The good school sample made better use of the facilities provided for them.

It would seem, therefore, that the good school experience and atmosphere which broadens children's mental horizons and enhances abstract thought, also raises the morale and innovativeness of the teachers who teach in the schools and increases the use of home facilities by the students who attend them. In contrast, the teachers in the poor schools appear to develop apathy towards their work. A vicious cycle, thus, is created, whereby attendance at a good school motivates both teacher and child to be resourceful and to do all they

possibly can within their limited resources to establish a conducive learning environment. On the converse, attendance at a poor school affects teacher and child alike, inhibits self-reliance, innovativeness and resourcefulness, all of which adversely affect school learning. On the basis of these observations, it can be said that the superior performance of the good school sample over the unschooled and poor schooled groups on all the dependent measures (Table III) could be partially explained in terms of the professional skills possessed by the good school teachers and in part to the teachers' raised morale which tended to reinforce their efforts.

Classification Data

The hypothesized relationship between GS, PS and US samples on the main dependent variables (AC, VC, LVR) were all supported. The mean scores of the GS sample on all the three variables were significantly ($p < .000$) higher (Table IV) than either the PS or the US group. The Unschooled and the Poor schooled samples did not significantly differ (Tables VII, VIII and IX). Apparently, the good school's verbal interaction (see school environment results) which provided children supportive interaction and greater opportunities to think in relational terms and to draw inferences, encouraged in children to look beyond the sensory data (Luria, 1971; Vygotsky, 1962) and to abstract the criterial attributes of their classificatory items. Children in this good school group made more sorts than any other group on the AC test (Table IV). Neither the type of training poor

school children received, training, which encouraged low level analytical thought and mere affirmation of facts, nor the traditional informal training, which discouraged productive adult-child verbal interaction resulted in a search for the higher level relational concept linking the stimulus items. Consequently, most items classified by these unschooled and poor schooled children were based either on the obvious nature of the attribute (e.g., colour) or the familiarity of the experience (e.g., shirt and sandals). What was not obvious, practical or familiar to them could not be immediately perceived as going together in some way. Hence, after the first sorting attempt, these PS and US children resorted to gazing away from the stimulus items with the result that they failed to think or reflect on the stimulus tasks and to see any more relationships that existed. For example, children in both samples (PS, US) frequently made one sorting response on each of the AC sets and then concluded: "That is all; I have finished," or "That is all I can do."

However, the greatest difference among the samples was observed in the verbal rationale the children gave for their AC sorted operations. The good schooled children were able to provide accurate and appropriate verbal description for the AC criterial attribute with a considerable degree of precision. The other children, however, frequently resorted to irrelevant circuitous descriptions (Price-William, 1962) with very little accuracy. E.g.:

> If I go to listen to the guitarist and I am wearing my sandals, I can give my sandals to the guitarist and, in turn, ask for the guitar to play some.

This implies that the most serious handicaps of the unschooled subjects were the lack of an ability to systematically verbalize their sorted stimulus items and a difficulty with being able to decentre from their traditional known experience and focus on the items displayed before them. The important aspect of these findings is that the superiority of the good school sample points to the underlying factors which make the good school experience facilitative of children's cognitive growth. Verbal interaction between teacher and pupil in a good school is at a higher level of abstraction. Questions asked are mainly open-ended and call for inferences and evaluation of facts. Teachers also provide supportive interaction to their pupils by praising effort and encouraging them to talk their ideas out which results in their active verbal communication in class. The cumulative effect of these different teaching behaviours is that the quality of the good school experience encouraged in children the habit of looking beyond the facts (Bruner, 1975) and promoted concrete abstract thought. It is perhaps the lack of these experiences in verbal communication skills which make both the poor schooled and unschooled samples' verbal behaviours identical and significantly different from the good school group (see Table III). The AC, VC and LVR results confirm the findings of Serpell (1969) who found that children who attended certain elite schools in Zambia, regardless of their age, significantly sorted on a functional level and verbalized more of their AC operations. Additionally, the proposition made by Cole and Scribner (1974) and by Suchman (1966) regarding the possible effect of quality schooling experience on children's cognitive skills are supported by the present study.

Another interesting finding of this study was on the first choice patterns of the samples on the AC and the VC variables. Despite the observed superiority of the good school sample over the poor schooled or unschooled groups on all the measures, the poor schooled and the unschooled children showed some preference for the "function" and "shape" classifications on their first choice AC (Table X). Although the expected result was not in this direction, it would seem logical to expect that the poor schooled and the unschooled samples, having had direct use of some of these items, were exhibiting pseudo-conceptual development. The overall VC response rate indicates the poor schooled and the unschooled samples were qualitatively inferior to the good school sample, supporting a pseudo-conceptual hypothesis. However, the fact that the poor schooled and unschooled subjects did classify and verbalize on both functional ahd shape levels even though at a minimal level, should be a caution to cross-cultural researchers who arbitrarily categorise their experimental subjects into schooled and unschooled groups with complete disregard to the nature of the formal school experience. Cognitive operational classification may not be an all or nothing affair. As some researchers (Kagan & Klein, 1973; Tulkin & Konner, 1973) have pointed out, the average child normally attains certain levels of conceptual development with some objects in his culture, particularly those objects which feature prominently in the subject's daily life activities (Price-William, Gordon & Ramirez, 1969; Kellaghan, 1968; Okongi, 1971). The unique aspect of such differences in types of conceptual development is that it is concrete and specific to the object(s) in question and cannot be

extended to other stimulus situations (Inhelder & Piaget, 1964). Thus, while the poor school and the unschooled subjects appeared to spontaneously classify and verbalize the functional attribute of such pictorial items as sandals and a native shirt, which are part of the context in terms of the children's experience, they could not extend the same level of conceptualization to the other pictorial stimulus items which were further removed from their experiential context (see Appendix I). Thus, such pseudo-conceptual development exhibited by poor schooled and unschooled subjects could be an additional factor which might have contributed to the lack of significant differences between schooled and unschooled samples in some previous empirical studies (Price-William, 1962; Goodnow, 1962; Goodnow & Bethon, 1967; Irwin & McLaughlin, 1970).

Support for the position that the school type actually accounted for real differences in classification ability, and that poor and unschooled children were engaging in pseudo-classification comes from the results comparing abstract ability and logical verbal reasoning. The relative contribution of children's Abstract Ability (AA) vis-à-vis schooling on verbal reasoning revealed that the AA of subjects contributed little (R = 0.08%) to logical verbal reasoning. On the other hand, schooling accounted for 18.70% of the variance in the children's verbal reasoning scores (Table XII). Thus, although children develop some form of primitive logical structure, when given a wider experience through the good school's verbal interaction they are able to solve problems on a more abstract level which in turn sharpens and improves the breadth and texture of children's cognitive structures (Bruner, 1975) beyond those promoted by maturational development. Such an

interpretation is supported by the findings of Cole and Scribner (1974) who reported that only schooling encourages verbalization of one's sorted operations. Thus, schooling not only had pronounced effects on children's communicative skills, but it also significantly facilitated the cognitive development of children with respect to the cognitive measures used in this study.

A final point of discussion concerns the sex interaction effect for abstract classification. Boys whether poor schooled or unschooled did significantly better than girls on the abstract classification tasks. This superiority of males over the female subjects on the abstract classification in the samples with informal or poor educational experience was no surprise. In a rural community, taboos are quite strong. Boys and girls are brought up to differentiate their sex roles (Kiminyo, 1973). The traditional sex role for girls is more restrictive and less achievement oriented (Nwigwe, 1978) than the type of training given to boys (see also discussion of the parents' SES on page 82). These sex-role differentiations could be responsible for the differences in score between boys and girls in the poor school and the unschooled groups on the abstract classification tasks. Interestingly, with good schooling experience, the sex differences in scores completely disappear and girls perform as well as boys. This positive good schooling effect on the performance of both sexes, further support the statement made earlier that the observed sex difference in scores was entirely the result of the different training experiences boys and girls receive rather than the result of a set of innate factors. Additionally, despite the abstract classification sex differences, girls

did not differ significantly from boys on the verbal classification or on the logical verbal reasoning problems. The reason for this became apparent upon close examination of the Akan cultural life. Girls are encouraged to be verbal and more articulate than boys, while at the same time receiving lower level achievement aspirations from their parents. For instance, it became evident from the parents' data that the common aspiration held for their daughters was for them to become either petty traders or seamstresses, both of which are considered low grade jobs in the Ghana SES classification (Ghana Pop. Census, 1960). In contrast, boys were expected to become fitting mechanics, teachers or go to college in some cases. Though these jobs reserved for boys are not the highest in the SES categorization of jobs, they constitute the middle level manpower and are much higher than the job expectations for girls. Therefore, the encouragement girls receive to be verbal and yet not to aspire to a higher level of achievement compensates for their restricted traditional socialization experience. Its effect, however, only brings them to parity with boys on tasks requiring verbal interaction.

Implications

Educational Implications

The results of the study have a number of implications for educational practice in Ghana.

It is evident that the acquisition of certain basics of conceptual development such as those embodied in logical reasoning and

classificatory logic, are subject to formal educational effects if an appropriate learning environment is provided. Since logical classification of concepts is essential for children's intellectual activity, it is suggested that teachers should prepare children for their school learning actiyities by helping them to acquire these concepts early in their school career at the primary school level.

The relative weakness of the rural poor school children in abstract classification and verbal abilities also leads to the conclusion that the schools should provide children special training in language interaction for communication and for abstraction through the use of verbal language. This training, in conjunction with improvised concrete local materials, should help children to develop the symbolic systems which will enable them to process and organize their experiential input.

The professional competence of the staff of poor schools, 75% of whom are untrained (see Appendices XII and XIII), should be one of the first areas approached to upgrade the rural schools. The teachers' training can initially be upgraded through the institution of an in-service training programme. Emphasis under such a program should be placed in general on the teacher's proficiency in the use of language (see Tables IV, VIII and IX) and in particular on the improvement of the teacher's use of language to teach verbal skills and concepts, and to prompt children to spontaneously use language to mediate thought (Jensen, 1966).

Furthermore, the unschooled children's inability to abstract and to verbalize at a higher level of conceptualization suggests that

much more emphasis should be placed on the use of non-verbal stimuli as the media of instruction. The non-verbal stimuli should be used at the initial school entry of these rural children and should be progressively changed to the use of verbal language to facilitate growth in their thinking. Thus, in the early grades of the primary school, concepts should be taught through concrete local materials which are known and familiar to the children. These should then be gradually removed out-of-context through the medium of language exposition. Such an approach would help to build on the strength these unschooled rural children already possess and thereby provide them with the confidence necessary for their assimilation into the formal school learning environment.

In the light of the above general suggestions, the following specific recommendations can be proposed:

1. As a long-term measure, the Teachers' Training Colleges must expand their intake to train more teachers for the poor schools. However, as a matter of urgency, the existing untrained staff of poor schools should be upgraded through intensive in-service training programmes. In the teacher's training, whether at college or in-service level, stress should be laid on the need:

   a. to teach language skills to facilitate the development of children's cognitive structures,

   b. to teach verbal concepts and spontaneous use of language to mediate problems,

   c. to encourage in children the habit of thinking in relational terms and for looking beyond the sensory data through the

practice of making inferences, comparing and contrasting materials taught in class,

d. to encourage verbal communication in class through children's active involvement in lessons and the development of children's ideas, e.g., asking questions, children's contribution to lessons and description of stimulus objects based on their mode of learning at the grade level, and,

e. for teachers to provide supportive interaction through praise and encouragement.

2. Certain basic learning facilities should be provided for the child in the home as evidenced in the demographic data (DD) results (see Table II and Appendix VII). Teachers could loan a few textbooks in the basic subjects to children for home study. Parents could provide their children with an improvised study table and some privacy or free time in the evenings for study. Occasional visits by teacher to the homes of the children and informal discussion with parents of the importance of conducive home learning environment for the child might also help to improve conditions.

3. Local materials which are known and familiar to the child should be utilized to maximize the child's learning potential.

4. Finally, new schools should try to meet the criteria of a good school as described in this study by being staffed with college or in-service-trained teachers who can effectively use verbal language and local materials to interact with pupils.

Theoretical Implications

The results of the study indicate that schooling greatly ($p < .000$) affected the samples' Abstract Classification, Verbal Classification and Logical Verbal Reasoning scores. Abstract Ability (AA) had virtually no effect on subjects' scores (see Table XI) nor was the Abstract Ability score influenced by schooling factor (see Table I). Such a finding adds more support to the perspective that highly developed abstract symbolic representational abilities which are essentially verbal abilities, are influenced by good schooling experiences. This supports the interactionist view of language (Bruner, 1964; Ausubel, 1968; Clark, 1973; Slobin, 1973). Thus, Piaget's assertion that the abstract logical classification involved in concrete operational thought is acquired mainly through organism-environment interaction (Wadsworth, 1977; Flavell, 1964; Inhelder & Piaget, 1964), with language playing lesser role in the process is questioned. As the data suggest, the kind of verbal exposition of a good school's "context-free learning" (Bruner, 1966; Scribner & Cole, 1973) orients children's thinking to relevant attributes of stimulus objects and, thus, provides a rule for processing the input data. The children are released from the "overpowerful appearance of visual display" (Bruner, 1964, 1975) and operate at a symbolic level of re-presentation. Good schooling verbal interaction, therefore, provides a handy tool for sophisticated elaboration of children's cognitive tasks. Hence, the study supports Bruner (1965, 1975), Scribner and Cole (1973), Ausubel (1968), Kendler (1964), Kagan (1966), Jensen (1966) and the Soviet psychologists, Luria (1959, 1961, 1971) and

Vygotsky (1962), on the relevance of spontaneous verbal mediation for facilitating cognitive processes.

The findings of the study also challenge the position of those who assume that a formal school verbal experience per se facilitates intellectual growth (Price-William, 1962; Irwin & McLaughlin, 1970; Mermelstein & Shulman, 1967). The important thing to note is that while a good school experience, which provides greater opportunities for verbal interaction at a higher level of symbolization, significantly enhances children's cognitive development, a poor school "context-free learning" (Bruner, 1965, 1975; Scribner & Cole, 1973), with its heavy stress on affirmation of facts and elliptical question patterns, has little effect on the development of children's logical classificatory skills. The poor school appears to have the same effect the traditional "context-bound" informal education has on cognitive growth. Therefore, those studies (Price-William, 1962; Goodnow, 1962; Goodnow & Bethon, 1966; Irwin & McLaughlin, 1970) which have reported no differences between schooled and unschooled children could have done so because of the type of schools selected. Where the educational experience was inferior, it approximated the experience of the unschooled sample and thereby produced no significant result. This type of experience may be what Price-William (1962) indirectly alluded to in his study as "a bush school experience." An experience which accounted for the lack of significant difference between his schooled and unschooled groups. Hence, the apparent contradictory findings in past research studies involving schooled and unschooled subjects could be a result of the type of school experience the selected school subjects had been involved in.

Research Implications

On the basis of the results of the study, four areas for further research may be suggested:

1. Since there was strong evidence favouring the effect a good schooling experience had on students' cognitive classification and verbal problem-solving ability, a follow-up study of the poor school and the good school children could be undertaken at the Middle school and the Secondary school levels to ascertain which type of children (GS, PS) progressively enter the second cycle of education. Such an information would be of social importance to Ghanaian educators and administrators.

2. To add further support to this study, the good school's quality verbal interaction needs to be used experimentally to determine if it induces the cognitive changes reported here.

3. It would be informative and useful to investigate also the effect of good schooling on the other phases of cognitive development, such as conservation, seriation and causality at the concrete operation stage.

4. A further study using Witkin's (1967) psychological differentiation model of field dependence/field independence or Kagan, Rosman, Day, Albert and Phillips' (1964) impulsivity and reflectivity conceptual tempo as independent variables might help educators to know the individual child's specific cognitive mode for processing information and thus allow one to cater for individual differences when applying the good school's verbal interaction.

Limitations of the Study

1. One limitation of the study arises from the fact that Flanders' (1968) school environment instrument has solely been used in Western society where children are encouraged to be highly verbal. On the contrary, in an African society, where most children have lower level verbal interactions, the instrument may not be as appropriate as when used in a Western society.

2. The second limitation stems from the notion that the logical verbal reasoning problems may not truly tap the logic differences between the samples. Logical verbal reasoning differences could be the result of verbal classification differences and therefore, the verbal production the subject chose to display to the researcher was the factor which influenced the results.

Conclusion

Previous studies merely examined the effects of the formal school experience as a global concept on cognitive operational classification. The present investigation examined the possible influence that certain variable educational experiences (US, PS, GS) might have on children's cognitive development as manifested in abstract classificatory and verbalization tasks. The novelty of the present study, therefore, is in the examination of the effects of the different levels of the formal school experience on cognitive operational functioning.

The results showed that good schooling significantly ($p < .000$) facilitated children's cognitive growth when compared to either no formal schooling or poor schooling (Tables VI-IX). Additionally, the

study revealed that the good school and the poor school types were significantly ($p < .01$) different from each other with respect to certain features characteristic of the school learning environment. For example, rich analytical verbal interaction, teacher's supportive rapport with pupils, and the development of children's ideas through open-ended and probing questions were frequently used in a good school while they were largely absent in poor schools. These could be the facilitating factors which seemed to push children's cognitive development further in the good schools.

More importantly, the results of the present study help to explain the inconsistent findings of past empirical studies. Previous investigators and the Harvard Center for Cognitive Studies under Bruner, Olver and Greenfield (1966) have assumed that schooling per se could bring about significant changes in intellectual growth quite superior to those nurtured by the traditional informal learning mode (Schmidt & Nzimande, 1970; Scribner & Cole, 1973; Cole, Gay, Glick & Sharp, 1971; Ausubel, 1968). Others, echoing purely the Piagetian view, have suggested that the effect of the formal school experience in abstract classificatory operations is not significantly different from those acquired through the traditional socialization (Price-William, 1962; Irwin & McLaughlin, 1970; Kagan & Klein, 1973; Goodnow, 1962; Mermelstein & Shulman, 1967). The present investigation has revealed that the true state of affairs lies between these extremes and that the lack of significant result in previous empirical studies could be due to the type of schools chosen for the research (Serpell, 1969; Suchman, 1966; Cole & Scribner, 1974).

The results of the study were discussed with respect to Piaget's theory of concrete operational thinking (Flavell, 1964; Inhelder & Piaget, 1964) and Bruner's (1975) theory of the formal school's verbal exposition as a facilitator of concrete abstraction. Specifically, the process of logical classification and the function of language in operational thought were examined and their implications in cognitive functioning, educational practice, theory and research discussed. The obvious social implication of the results is that we may be depriving many children in Ghana (71.1%--U.N.O., 1974) of the cognitive enrichment necessary to enhance their intellectual growth by not providing them adequate good educational experience in the early years of their basic education.

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APPENDICES

APPENDIX I

CLASSIFICATORY ITEMS

Set 1

Dimension	Pictures	Critical Attributes
Colour	Clock	(Yellow and round.)
Shape	Orange	(Round and to eat.)
Function	Banana	(Yellow and to eat.)

Set 2

Colour	Sandal	(Wear and shape.)
Shape	Shirt	(Wear and red.)
Function	Guitar	(Red and shape.)

Set 3

Colour	Bicycle	(Black and ride.)
Shape	Helmet	(Shape and black.)
Function	Car	(Ride and shape.)

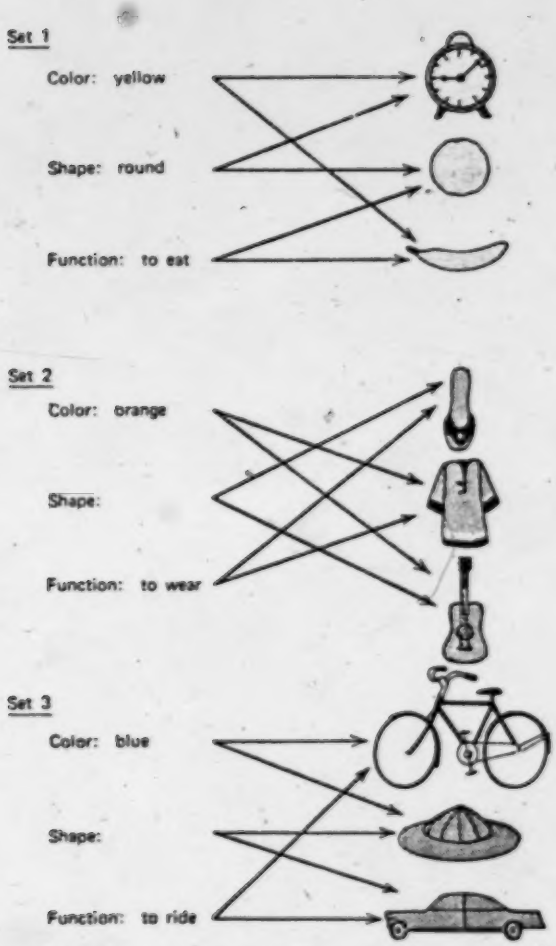

Figure 5-2. Three picture displays in Wolof classification study, with their attributes. *Set 1,* clock, orange, and banana; *Set 2,* sandal, *bubu* (Wolof robe), and guitar; *Set 3,* bicycle, helmet, and car.

Source: Greenfield, Reich and Olver (1966).

APPENDIX II

VERBAL REASONING PROBLEMS

1. In the north of Ghana where it is hot all the year round, the goats are tall. "Wa" is a town in the north. Are the goats tall in that town or not? Why?

2. Kofi resembles your brother. Your brother looks like one of the chief's sons. Apart from your brother, who else does Kofi resemble? Why?

3. Spider and rat always drink together. Rat is at a funeral drinking. Is spider also drinking? Why?

4. If the gong-gong beater or the linguist drinks "Apeteshi," the chief gets annoyed. The gong-gong beater is not drinking "Apeteshi." The chief is annoyed. Has the linguist drank "Apeteshi?" Why?

5. Kofi Mensa's friend either gave him a chicken or a sheep. Kofi Mensa's friend did not give him a chicken. Did he give him a sheep? Why?

6. Some educated people are wealthy. All wealthy people are boastful. Are some educated people boastful? Why?

APPENDIX III

ABSTRACT CLASSIFICATION RECORDING SHEET

1. Subject's Number . . . . . Total Score . . . . . .

2. Name of School . . . . . Date . . . . . .

3. Type of Educational experience: [ ] Good school, [ ] Poor school

[ ] informal

4. Sex: [ ] male, [ ] female

5. Educational Level: [ ] Grade 5 [ ] Grade 6 [ ] not applicable

6. Age: [ ] 11 years [ ] 12 years [ ] other, specify . . . . . .

7. Test begun . . . . . Test ended . . . . . Total time . . . . .

SET I

Choice	Colour	Shape	Function	No Class-inclusion*	Score
First					
Second					
Third					

SET II

Choice	Colour	Shape	Function	No Class-inclusion*	Score
First					
Second					
Third					

SET III

Choice	Colour	Shape	Function	No Class-inclusion*	Score
First					
Second					
Third					

*Use C (colour), S (shape) or F (function) to indicate combination formed.

APPENDIX IV

VERBAL CLASSIFICATION RECORDING SHEET

1. Subject's Number . . . . . Total Score . . . . . .
2. Name of school . . . . . Date . . . . . .
3. Type of educational experience: [ ] Good school [ ] Poor school
   [ ] informal
4. Sex: [ ] male [ ] female
5. Educational level [ ] Grade 5 [ ] Grade 6 [ ] not applicable
6. Age: [ ] 11 years [ ] 12 years [ ] other, specify . . . . . .
7. Test begun: . . . . . Test ended . . . . . Total time . . . .

SET I

Choice	Colour		Shape		Function		Description*	Score
	Right	Wrong	Right	Wrong	Right	Wrong		
First								
Second								
Third								

SET II

Choice	Colour		Shape		Function		Description*	Score
	Right	Wrong	Right	Wrong	Right	Wrong		
First								
Second								
Third								

SET III

Choice	Colour		Shape		Function		Description*	Score
	Right	Wrong	Right	Wrong	Right	Wrong		
First								
Second								
Third								

*Use G (general) or I (itemized) to indicate type of statement.

APPENDIX V

LOGICAL VERBAL REASONING RECORDING SHEET

1. Subject's Number . . . . . Total Score . . . . . .
2. Name of school . . . . . Date . . . . . .
3. Type of educational experience: [ ] Good school [ ] Poor school
   [ ] informal
4. Sex: [ ] male [ ] female
5. Educational level [ ] Grade 5 [ ] Grade 6 [ ] not applicable
6. Age: [ ] 11 years [ ] 12 years [ ] other, specify . . . . . .
7. Test begun: . . . . . Test ended . . . . . Total time . . . .

Question	Responses		Reasons		
	Right	Wrong	Premise Accepted	Premise Omitted	Additional Premise Added
1					
2					
3					
4					
5					
6					

APPENDIX VI

SCORING SYSTEM FOR ABSTRACT CLASSIFICATION (AC), VERBAL CLASSIFICATION (VC) AND LOGICAL VERBAL REASONING (LVR)

I Classification

Colour	(1)
Shape	(2)
Function	(3)

II Verbalization

Correct colour reason	(1)
Correct shape reason	(2)
Correct function reason	(3)

III Syllogistic Problems

Each correct response	(1)

APPENDIX VII

DEMOGRAPHIC DATA

Subject's Identification Number . . . . . Date . . . . . .

Name of school . . . . . Total score . . . .

Subject's Background

1. Sex . . . . . 2. Tribe . . . . . .

3. Type of Educational Experience . . . . . .

4. Grade Level . . . . . 5. Age . . . . . .

6. Place of birth . . . . . .

7. Present home town . . . . . .

8. Number of years lived in present town . . . . . .

9. Other places lived . . . . . .

Cultural Background

	1	0
	yes	no
10. Do you have basic textbooks to use at home?		
11. Do you have a small collection of other books for use at home?		
12. Do your parents get a daily newspaper?		
13. Do your parents have a radio?		
14. Do your parents have a record player?		
15. Do you have your own private room for study at home?		
16. Is there a study table at home?		
17. Do you receive help from any of your extended relatives for your education?		

18. To what degree:

Hardly ever	Moderate	Quite substantial
1	2	3

19. What kind of help is given to you? . . . . . .

20. Languages spoken other than Assin . . . . . .

21. How often do you use it:

Hardly ever	Quite often	Most of the time
1	2	3

22. What is your birth order in the family? . . . . . .

23. Number of brothers . . . . . .

24. Number of brothers attending school . . . . . .

25. Number of sisters . . . . . .

26. Number of sisters attending school . . . . . .

27. Level of education of sisters . . . . . .

28. Level of education of brothers . . . . . .

Scoring

1. The following questions were scored 1 if answered yes and 0 if answered no: 10-17, 19, 20 and 24-28.

2. The remaining questions were scored as follows:

(i) 18 and 21:

Hardly ever	Quite often	Most of the time
1	2	3

(ii) 22 and 23:

a. 7 and above	b. 4 to 6	c. 1 to 3
1	2	3

3. Questions 1-9 did not enter into the scoring procedure. The total possible score on the DD therefore was 27.

APPENDIX VIII

PARENTS' SES BACKGROUND

Identification Number . . . . . .

FATHER

1. Present occupation . . . . . .
2. Job experience . . . . . .
3. Other types of job done . . . . . .
4. Past work done . . . . . .
5. Present average annual income . . . . . .
6. Educational level . . . . . .
7. Membership to club or organization . . . . . .
8. Aspirations for child's education . . . . . .
9. Do you help your child with his education? Yes No
10. What kind of help? . . . . . .
11. To what degree:

Hardly ever	Moderate	Quite substantial
1	2	3

12. Would you like to be able to help your children more than you do? . . . . . .

MOTHER

13. Present occupation . . . . . .
14. Job experience . . . . . .

15. Other types of work done . . . . . .

16. Past work done . . . . . .

17. Present average annual income . . . . . .

18. Educational level . . . . . .

19. Membership to club or organization . . . . . .

20. Aspirations for child's education . . . . . .

21. Do you help your children with their education? Yes No

22. What kind of help? . . . . . .

23. To what degree:

Hardly ever	Moderate	Quite substantial
1	2	3

24. Would you like to be able to help your children more than you do? . . . . . .

OTHER

25. Number of children by both mother and father . . . . . .

26. How active is the Town Development Committee in helping to develop the school in your town?

Not helpful	fairly helpful	very helpful
1	2	3

27. How active is the school committee in helping to develop the school in your town?

Not helpful	fairly helpful	very helpful
1	2	3

28. What factors contribute to the lack of improvement of the school in your town? . . . . . .

APPENDIX IX

PARENTS' SES SCORING SHEET

1. The following questions were scored 1 if answered yes and 0 if answered no: 2-4, 7-10, 12, 14-16, 19-22, 24 and 28.

2. The remaining questions were scored as follows:

(i)	1 and 13:	a. Unskilled	b. Skilled	c. Professional
		1	2	3
(ii)	5 and 17:	a. Low Income (below ¢2,500)	b. Middle Income (¢2,500-4,000)	c. High Income (¢4,000 and above)
		1	2	3
(iii)	6 and 18:	Literate	Illiterate	
		1	0	
(iv)	11 and 23:	Hardly ever	Moderate	Quite substantial
		1	2	3
(v)	25:	a. 7 and above	b. 4 to 6	c. 1 to 3
		1	2	3
(vi)	26 and 27:	a. Not helpful	b. Fairly helpful	c. Very helpful
		1	2	3

APPENDIX X

SCHOOL ENVIRONMENT SCORING SHEET AND SCORES

	1	2	3	4
A. TEACHING BEHAVIOUR	Quite often	Often	Moderate	Hardly ever
1. Question type				
a. Yes/no b. Single answer				
	Hardly ever	Less often	Moderate	Quite often
c. Inference (synthesis and evaluation) d. Open-ended e. Extension (analysis)				
2. Helpfulness				
a. Practical/ materials b. Demonstrations c. Child-centered				
	Quite often	Often	Moderate	Hardly ever
d. Verbal e. Teacher-centered				
	Hardly ever	Less often	Moderate	Quite often
3. Language of Teacher				
a. English b. Vernacular				

TEACHING BEHAVIOUR SCORES*

	PS_1	PS_2	GS_1	GS_2
1. Question Type				
a. Yes/no	2	1.5	2.5	3.5
b. Single answer	2.5	2.5	2.5	4
c. Inference (synthesis and evaluation)	2.5	2	2.5	3
d. Open-ended	2.5	2	2.5	3.5
e. Extension (analysis)	2	1	2	3.5
2. Helpfulness				
a. Practical/ materials	2	1.5	1.5	2.5
b. Demonstrations	2	1	2.5	3.5
c. Child-centered	2.5	2.5	2.5	3.7
d. Verbal	2	2	2.5	3.5
e. Teacher-centered	2	1	2	3.5
3. Language of Teacher				
a. English	1.5	1.5	2.5	3
b. Vernacular	2.5	3	3.5	3
	27	21.5	29	40

*The metric changes within the Teaching Behaviour category. High scores in all cases indicate higher qualitative interaction (see p. 122, Appendix X, A).

The scores shown in the table are the average for the two teachers (grades 5 and 6) of each school type observed.

B. CLASSROOM INTERACTION

1. Teacher Talk

I. Response

a. Accepts feelings
b. Praises/ encourages
c. Accepts/uses ideas of students
d. Asks questions

II. Initiation

e. Lecturing
f. Giving directions
g. Criticizing/ justifying authority

2. Student Talk

I. Response

a. Student's talk in response to teacher

II. Initiation

a. Student's initiated talk
b. Silence/confusion

1	2	3	4
Hardly ever	Less often	Moderate	Quite often
Quite often	Often	Moderate	Hardly ever
Hardly ever	Less often	Moderate	Quite often
Quite often	Often	Moderate	Hardly ever

CLASSROOM INTERACTION SCORES*

	PS_1	PS_2	GS_1	GS_2
1. Teacher Talk				
I. Response				
a. Accepts feelings	2	1.5	2	3.5
b. Praises/encourages	2.5	1.5	2.5	3.5
c. Accepts/uses ideas of students	2.5	1	2.5	4
d. Asks questions	2	1.5	2	4
II. Initiation				
e. Lecturing	2	2	2	3
f. Giving directions	2.5	2	2.5	3
g. Criticizing/ justifying authority	2.5	2.5	2.5	3.5
2. Student Talk				
I. Response				
a. Student's talk in response to teacher	2	1.5	3	3.5
II. Initiation				
a. Student's initiated talk	2	1	3	3.5
b. Silence/confusion	3	2	3	4
	23	16.5	25	35.5

*The metric changes within the Classroom Interaction category. High schores in all cases indicate higher qualitative interaction (see p. 124, Appendix X, B).

The scores shown in the table are the average for two teachers (grades 5 and 6) of each school type observed.

APPENDIX XI

FIRST POOR SCHOOL'S INVENTORY

ITEMS	GRADES					
	1	2	3	4	5	6
1. Number on Roll						
Boys	20	23	21	16	12	10
Girls	16	8	8	5	9	7
2. Furniture						
Desks, Tables and Chairs .	10	26	28	16	20	17
3. Textbooks						
English	25	20	15	12	--	--
Arithmetic	30	25	20	18	15	10
Vernacular	20	15	10	10	5	--
4. Staffing						
Untrained (M.S.L.C.) . . .		*	*	*	*	
Certificate "B"						
Certificate "A" (Post "B")						
Certificate "A" (Four-year)	*					*
Certificate "A" (Post-Secondary)						
5. Teaching Experience (in years)	3	1	2	3	1	12
6. Classroom Structure						
Bamboo Shed			*	*	*	*
Permanent Block	*	*				

APPENDIX XII

SECOND POOR SCHOOL'S INVENTORY

ITEMS	GRADES					
	1	2	3	4	5	6
1. Number on Roll						
Boys	13	10	9	6	8	10
Girls	17	9	8	8	4	5
2. Furniture						
Desks, Tables and Chairs .	20	17	15	7	12	5
3. Textbooks						
English	30	19	10	7	10	15
Arithmetic	30	19	11	10	10	6
Vernacular	30	3	11	8	--	3
4. Staffing						
Untrained (M.S.L.C.) . .		*	*	*	*	*
Certificate "B"						
Certificate "A" (Post "B")						
Certificate "A" (Four-year)						
Certificate "A" (Post-Secondary)	*					
5. Teaching Experience (in years)	8	0.08	3	3	5	3
6. Classroom Structure						
Bamboo Shed				*	*	*
Permanent Block	*	*	*			

APPENDIX XII

FIRST GOOD SCHOOL'S INVENTORY

ITEMS	GRADES					
	1	2	3	4	5	6
1. Number on Roll						
Boys	24	23	26	25	20	18
Girls	23	23	20	12	10	10
2. Furniture						
Desks, Tables and Chairs .	42	35	40	38	30	30
3. Textbooks						
English	46	42	40	36	30	46
Arithmetic	46	46	38	46	35	30
Vernacular	37	40	35	30	40	29
4. Staffing						
Untrained (M.S.L.C.) . . .					*	
Certificate "B"		*	*			
Certificate "A" (Post "B")				*		
Certificate "A" (Four-year)	*					*
Certificate "A" (Post-Secondary)						
5. Teaching Experience (in years)	4	6	4	25	0.17	8
6. Classroom Structure						
Bamboo Shed						
Permanent Block	*	*	*	*	*	*

APPENDIX XIII

SECOND GOOD SCHOOL'S INVENTORY

ITEMS	GRADES					
	1	2	3	4	5	6
1. Number on Roll						
Boys	21	16	21	21	24	21
Girls	23	23	19	14	15	19
2. Furniture						
Desks, Tables and Chairs .	37	36	35	34	40	42
3. Textbooks						
English	46	46	46	46	46	46
Arithmetic	46	46	46	46	46	46
Vernacular	46	40	38	46	46	46
4. Staffing						
Untrained (M.S.L.C.) . . .						
Certificate "B"						
Certificate "A" (Post "B")	*					
Certificate "A" (Four-year)		*	*	*	*	
Certificate "A" (Post-Secondary)						*
5. Teaching Experience (in years)	20	3	9	8	8	5
6. Classroom Structure						
Bamboo Shed						
Permanent Block	*	*	*	*	*	*

APPENDIX XV

Educational Psychology Department
The University of Alberta
Edmonton, Alberta
Canada T6G 2G5

The Assistant Director
Ghana Teaching Service
Assin Foso
Ghana, West Africa

Dear Sir:

RESEARCH: REQUEST FOR PERMISSION TO USE SCHOOLS

I am a graduate student at the Faculty of Graduate Studies, University of Alberta, Edmonton, and currently working on my Ph.D. dissertation.

My topic is "An Investigation into the Effects of Different Educational Experiences on Classificatory and Verbal Reasoning Behaviour of Children in Ghana." More specifically, the study examines the relative influence of a "good" school, a "poor" school and the traditional informal educational experiences on children's cognitive operational functioning.

The school subjects will be drawn from the following sample of schools in your district:

1. Assin Tomfokoro/Abaase Local Authority Primary School
2. Assin Ayaase Local Authority Primary School
3. Assin Jakai Local Authority Primary School
4. Assin Bosomadwe Local Authority Primary School
5. Assin Odumase Local Authority Primary School
6. Assin Manso Local Authority Primary School
7. Fanti Nyankumase Local Authority Primary School.

I should be grateful if you would grant me permission for the use of the schools during the months of November and December 1978. The classes to be affected are mainly Primary five and six in each school.

/2

Your immediate reply will be deeply appreciated.

Yours sincerely,

Dominic K. Fobih

c.c.:

The Head Teacher
L/A Primary School
Assin Romfokor/Abaase
Via Fanti Nyankumasi
Cape Coast
Ghana, West Africa

The Head Teacher
L/A Primary School
Assin Odumase
Via Fanti Nyankumasi
Cape Coast
Ghana, West Africa

The Head Teacher
L/A Primary School
Assin Ayaase
Via Fanti Nyankumasi
Cape Coast
Ghana, West Africa

The Head Teacher
L/A Primary School
Assin Manso
Via Cape Coast
Ghana, West Africa

The Head Teacher
L/A Primary School
Assin Jakai
Via Cape Coast
Ghana, West Africa

The Head Teacher
L/A Primary School
Fanti Nyankumasi
Via Cape Coast
Ghana, West Africa

The Head Teacher
L/A Primary School
Assin Bosomadwe
Via Fanti Nyankumasi
Cape Coast
Ghana, West Africa

APPENDIX XVI

RAVEN'S STANDARD PROGRESSIVE MATRICES
Sets A, B, C, D, and E

Date .....

Name ..... Sex ..... Age .....

School ..... Grade .....

Test Begun ..... Test Ended ..... Total Time .....

A		B		C		D		E	
1		1		1		1		1	
2		2		2		2		2	
3		3		3		3		3	
4		4		4		4		4	
5		5		5		5		5	
6		6		6		6		6	
7		7		7		7		7	
8		8		8		8		8	
9		9		9		9		9	
10		10		10		10		10	
11		11		11		11		11	
12		12		12		12		12	

Total Score ..... Percentile .....